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Coastal Marine Institute

Effects of Oil and Gas Development: A Current Awareness Bibliography



Coastal Marine Institute

Effects of Oil and Gas Development: A Current Awareness Bibliography

Compilers

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Preface

Effects of Oil and Gas Development: A Current Awareness Bibliography is created as part of the research initiative between LUMCON, MMS and the Coastal Marine Institute (CMI), with the aim of providing current awareness in all aspects of offshore oil and gas development. Eleven quarterly issues were prepared from January 1998 to July 2000 that contained ~850 citations, and were compiled into *Effects of Oil and Gas Development: A Current Awareness Bibliography*.

The bibliography evolved from 1990 to 1994 in response to increased demand and MMS's changing needs. Initially, there were no subject divisions and circulation was relatively limited. Eventually, the bibliography was sent quarterly to over 300 patrons who have direct ties to or interest in Minerals Management Service and coastal marine issues. In January 2000, a web base electronic database was created. The database includes all citations from inception. The database can be search by either quarterly issues or cumulative reports. Other types of searches that are applicable are: Author, Subject or keyword phrases. The database allows users to print their own copy of the published report. Starting in January 2001, the bibliography will be distributed electronically, with the anticipation of users going up accordingly.

Denise Landry, LUMCON Librarian, compiled the first three issues of the bibliography. Ms. Landry's successor as LUMCON Librarian, Jacqueline Riley, prepared the October 1990 through January 1993 issues. Sue Ann Lewandowski, Ms. Riley's successor, prepared the April 1993 through October 1994 issues and edited the first cumulative bibliography. Ms. Lewandowski was succeeded by Christopher Hooper-Lane, who compiled the January 1995 through April 1997 issues. Shanna Bonvillain, LUMCON Library Assistant Librarian, compiled the July 1997 issue with the assistance of Glenda Carter. Ms. Bonvillain also assisted in the compilation of all previous issues of the bibliography. The second cumulative bibliography was compiled by Shanna Bonvillain and Mr. Hooper-Lane's successor as LUMCON Librarian, Donna Rice. Donna Rice LUMCON Librarian, and Shanna Bonvillain compiled January 1998-April 1999 quarterly issues. Shanna Bonvillain, in the absence of a Librarian, compiled the July 1999 quarterly issue with the assistance of Dr. Quay Dortch. Shanna Bonvillain compiled October 1999-April 2000 quarterly issues. Ms. Rice was succeeded by John Conover, who compiled the July 2000 quarterly issue and edited the third cumulative bibliography with the assistance of Shanna Bonvillain.

The bibliography was compiled at the Louisiana Universities Marine Consortium's Marine Center Library (LUMCON Library) on a *Microsoft SQL* server and uploaded to *Microsoft Word for Windows* for editing. The quarterly issues were formatted, photocopied, and mailed out from the LUMCON Library.

Contained in the following bibliography are citations from approximately 1997 through 2000.

The citations are arranged by main entry, which is author, if known, and title if there is no acknowledged author or if the author's name was unavailable to the bibliographers. Corporate author citations were used whenever appropriate. The title main entry citations are listed at the beginning of each of the five sections followed by the author main entry citations.

The bibliography is alphabetized in an order represented by the example in Table 1.

Table 1. Example of Alphabetization. (The first few words of hypothetical citations are listed.)

I tanker...	LAB Laboratories	Nednor, G.
1 a becomes the...	LaBrea, L.	The next phase...
96 sites...	MacAllister, T.	Norton, J. C.
Abernathy, C.	MacPherson, A. J.	A novel plan...
Al-Ahmed, M.	McMahon, S.	US Congress, Director...
Albanny, P. K.	Manuel, A. T.	US Congress, Office of...
Al-Sarif, B.	Manuel, A. T. D.	US Congress, Personnel...
Axon Corporation	Manuel, J.	USA all the way...
Bertram, D. J. M.	NAF database is...	United Industries says...
Bertram-Xavier, A.	NETCO cited in...	
La Link, O.	Nash, C. S.	

Information that appears in square brackets, [], in a citation is tentatively correct. As much information as was available was included.

The majority of citations are to journal articles, books, book chapters, conference proceedings and papers in conference proceedings. A few audio-visual and electronic works are cited and their format is indicated, though the citations are not divided into sections by format.

The broad subject areas covered in the bibliography are biology, chemistry/geochemistry/geology, engineering/physics, environment/ecosystem management/spills, and socioeconomic/regulation/general.

Table of Contents

BIOLOGY.....	1
CHEMISTRY/GEOCHEMISTRY/GEOLOGY.....	20
ENGINEERING/PHYSICS.....	41
ENVIRONMENT/ECOSYSTEMMANAGEMENT/SPILLS.....	54
SOCIOECONOMIC/REGULATION/GENERAL.....	62

- Aas, Endre; Beyer, Jonny; Goksøyr, Anders **PAH in fish bile detected by fixed wavelength fluorescence.** *Marine Environmental Research*. 1998; 46 (1/5):225-228. ISSN: 0141-1136.
This paper details a simple method of PAH detection by diluting gallbladder bile in ethanol or water and fluorescing it with fixed wavelengths. This is a low cost method to measure PAH exposure for a large number of fish.
- Aas, Endre; Klungsøyr, Jarle. **PAH metabolites in bile and EROD activity in North Sea fish.** *Marine Environmental Research*. 1998; 46 (1/5):229-232. ISSN: 0141-1136.
Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), and long rough dab (*Hippoglossoides platessoides*) were sampled for levels of PAH concentrations, from contaminated and control areas of the North Sea. No differences in the levels of PAH metabolites in bile or EROD activity in livers was observed.
- Agler, B. A.; Kendall, S. J.; Irons, D. D.; Klsiewski, S. P. **Declines in marine bird populations in Prince William Sound, Alaska coincident with a climatic regime shift.** *Waterbirds*. 1999; 22 (1):98-103.
This study focuses on the decline of several taxa of marine birds in Prince William Sound that either prey on fish or feed on benthic invertebrates. Much of the population decline appears to be related to a change in forage fish abundance that occurred during a climatic regime shift, in the North Pacific Ocean, although several of the marine bird population were killed by the *Exxon Valdez* oil spill.
- Al Bakri, D.; Kittaneh F. **Physicochemical characteristics and pollution indicators in the intertidal zone of Kuwait: implications for benthic ecology.** *Environmental Management*. 1998; 22 (3):415-424. ISSN: 0364-152X.
A study of Kuwait's coastal environment, physicochemical characteristics and other pollution indicators, highlight a prevailing stressed and fragile intertidal zone. Harsh environmental conditions in the intertidal zone have restricted benthic fauna diversity.
- Anderson, D. W.; Newman, S. H.; Kelly, P. R.; Herzog, S. K.; Lewis, K. P. An experimental soft-release of oil-spill rehabilitated American coots (*Fulica americana*): I. Lingering effects on survival, condition and behavior. *Environment Pollution*. 2000; 107 (3):285-294. ISSN: 0269-7491.
The objectives of this study were to determine the long-term effects of oil spill rehabilitation and to document survival, body condition, and behavior on American coots.
- Andres, B.A. **The Exxon Valdez oil spill disrupted the breeding of black oystercatchers.** *Journal of Wildlife Management*. October 1997; 61 (4):1322-1328. ISSN: 0022-541X.
After the *Exxon Valdez* oil spill, 36% fewer pairs of oystercatchers (*Haematopus bachmani*) occupied oiled islands in Prince William Sound than before the spill.
- Ansari, Z. A.; Saldanha, M.C.; Rajkumar, R. **Effects of petroleum hydrocarbons on the growth of a microalga, *Isochrysis sp.* (Chrysophyta).** *Oceanographic Literature Review*. June 1998; 45 (6):1034. ISSN: 0967-0653.
Most concentrations of Bombay High crude oil depressed the growth rate of the microalga.
- Anulacion, B. F.; Myers, M. S.; Willis, M. L.; Collier, T. K. **Quantitation of CYP1A expression in two flatfish species showing different prevalences of contaminant-induced hepatic disease.** *Marine Environmental Research*. 1998; 46 (1/5):7-11. ISSN: 0141-1136.
Starry flounder (*Platichthys stellatus*) hepatocytes showed a markedly reduced expression of CYP1A than the hepatocytes of the English sole (*Pleuronectes vetulus*) tested.
- Bass, C.; Sanders, P.; LappinScott, H. **Study of biofilms of sulfidogens from North Sea oil production facilities using continuous-flow apparatus.** *Geomicrobiology Journal*. April-June 1998; 15 (2):101-120. ISSN: 0149-0451.
A high temperature anaerobic continuous-flow tool was devised to study biofilms of sulfide-generating bacteria. Biofilms were established within 5 days of the initiation of the fluid.
- Batten, S. D.; Allen, R. J. S.; Wotton, C. O. M. **The effects of the Sea Empress oil spill on the plankton of the southern Irish Sea.** *Marine Pollution Bulletin*. 1998; 36 (10):764-774. ISSN: 0025-326X.
The Continuous Plankton Recorder has been taking plankton samples in the area of the *Sea Empress* oil spill since 1970. Only a minor shift in species composition has been observed.
- Baumard, P.; Budzinski, H.; Garrigues, P. **Polycyclic aromatic hydrocarbons in sediments and mussels of the western Mediterranean sea.** *Environmental Toxicology and Chemistry*. May 1998; 17 (5):765-776. ISSN: 0730-7268.
Mussels from Corsica and Sardinia contained petrogenic PAHs in concentrations ranging from 25 to 390 ng/g. Phenanthrene and anthracene appeared to be absorbed in the water-dissolved form, but heavier PAHs appeared to be absorbed as adsorbed on particles.

- Baumard, P.; Budzinski, H.; Garrigues, P. **PAHs in Arcachon Bay, France: origin and biomonitoring with caged organisms.** *Marine Pollution Bulletin*. August 1998; 36 (8):577-586. ISSN: 0025-326X.
The PAH uptake by caged mussels (*Mytilus galloprovincialis*) increased exponentially with higher levels of contaminated sediments.
- Baumard, P.; et al. **Polycyclic aromatic hydrocarbons in recent sediments and mussels (*Mytilus edulis*) from the Western Baltic Sea: occurrence, bioavailability and seasonal variations.** *Marine Environmental Research*. 1999; 47 (1):17-47. ISSN: 0141-1136.
Mussels and surface sediment samples were collected on three research cruises in the Baltic Sea during 1995 and 1996 and analyzed for PAH contamination. There was a moderate correlation between the mussel and sediment PAH content.
- Baumard, P.; et al. **Concentrations of PAHs (Polycyclic Aromatic Hydrocarbons) in various marine organisms in relation to those in sediments and to trophic level.** *Marine Pollution Bulletin*. 36 (12):951-970. ISSN: 0025-326X.
Mussels, fish, crabs and other crustaceans were sampled along European coasts. PAH concentrations were significantly negatively correlated with molecular weights of the contaminant compounds, and concentration variations resulted from different feeding habits of the organisms tested.
- Baumard, P.; et al. **Origin and bioavailability of PAHs in the Mediterranean Sea from mussel and sediment records.** *Estuarine Coastal and Shelf Science*. July 1998; 47 (1):77-90. ISSN: 0272-7714.
The mussels (*Mytilus galloprovincialis*) sampled showed very low levels of contamination with the exception of mussels taken from the Pont Vendres and Barcelona harbors.
- Begg, G.S.; Reid, J.B.; Tasker, M.L.; Webb, A. **Assessing the vulnerability of seabirds to oil pollution: sensitivity to spatial scale.** *Colonial Waterbirds*. 1997; 20 (2):339-352. ISSN: 0738-6028.
Oil pollution and seabird distribution patterns are scale dependent, thus it was suspected that interactions between oil pollution and seabirds would be dependent on spatial scale.
- Bell, N.; Smith, J. **Coral growing on North Sea oil rigs.** *Nature*. 1999; 402 (6762):601. ISSN: 0028-0836.
The coral (*Lophelia*) was found growing on the Brent Spar oil-storage buoy, located in the North Sea, during its decommissioning. Apparently, healthy colonies have been exposed to quality standards of operational discharges, but they were not affected by discharges from the oil platforms. These findings indicate that *Lophelia* has a wider distribution and a more rapid rate of growth than previously believed.
- Bennett, A.; Bianchi, T. S.; Means, J. C.; Carman, K. R. **The effects of polycyclic aromatic hydrocarbon contamination and grazing on the abundance and composition of microphytobenthos in salt marsh sediments (Pass Fourchon, LA) I. A microcosm experiment.** *Journal of Experimental Marine Biology and Ecology*. 1999; 242 (1):1-20. ISSN: 0022-0981.
Surface sediments collected from a salt marsh in Pass Fourchon, LA, were used in a microcosm study to examine the effects of polycyclic aromatic hydrocarbon contamination on the abundance and composition of microphytobenthos. Changes in the microphytobenthos exposed to sediments treated with high and low levels of PAHs, were monitored by using plant pigments as a biomarker. Grazing pressure on microphytobenthos by the periwinkle snail (*Littorina irrorata*) as well as its responses to PAH contamination were also examined.
- Beyrem, H.; Aissa, P. **Impact of oil pollution on the meiobenthic densities of the littoral of Bizerta (Tunisia).** *Vie et Milieu - Life and Environment*. September 1998; 48 (3):183-190. ISSN: 0240-8759.
Comparisons of nematodes obtained in various sectors of a permanent oil discharge, are compared to other meiofaunal groups, to determine their resistance to chronic oil pollution. It appears that the nematofauna is more resistant, but nevertheless quantitatively affected by chronic oil pollution.
- Bickham, J.W., et al. **Flow cytometric determination of genotoxic effects of exposure to petroleum in mink and sea otters.** *Ecotoxicology*. August 1998; 7 (4):191-199. ISSN: 0963-9292.
Experiments were conducted on female mink prior to and during pregnancy, and on yearling female mink. The kits of the females exposed during pregnancy exhibited increased genome size in kidney samples, but no clastogenic effects in kidney and liver tissue. The yearlings exhibited clastogenic damage in the spleen, but none in the kidney tissue and no increased genome size were observed. Blood samples were also taken from two populations of sea otters: one contaminated by the *Exxon Valdez* oil spill, and the other a control group.
- Binark, N.; Guven, K. C.; Gezgin, T.; Unlu, S. **Oil pollution of marine algae.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 64 (6):866-872. ISSN: 0007-4861.
Oil pollution was determined by the measurement of alkanes and aromatics on the surface and inside of algae. PAHs were discovered both on the surface and inside the algae. Authors believe that testing algae is a good indicator of seawater pollution.

- Blenkinsopp, S. A., et al. **Toxicity of the weathered crude oil used at the Newfoundland Offshore Burn Experiment (NOBE) and the resultant burn residue.** *Spill Science & Technology Bulletin*. 1996; 3 (4):277-280. ISSN: 1353-2561.
Water-accommodation fractions (WAF) were prepared from Alberta sweet mixed blend (ASMB). Burned residue was tested on one freshwater fish species, a saltwater fish and gametes of a species of sea urchin. This experiment proved non-toxic to all species tested.
- Bodkin, J. L.; Burdin, A. M.; Ryazanov, D. A. **Age - and sex-specific mortality and population structure in sea otters.** *Marine Mammal Science*. 2000; 16 (1):201-219. ISSN: 0824-0469.
Over three hundred carcasses of sea otters were collected five days after the T/V *Exxon Valdez* oil spill and were used to characterize data for the affected sea otter population.
- Bogovski, Sergei; Sergeev, B.; Muzyka, V.; Karlova, S. **Cytochrome P450 system and heme synthesis enzymes activity in flounder liver as biomarkers of marine environments pollution.** *Marine Environmental Research*. 1998; 46 (1-5):13-16. ISSN: 0141-1136.
Aryl hydrocarbon hydroxylase levels can be used to demonstrate toxic contamination of marine environments in relation to the Baltic flounder (*Platichthys flesus*).
- Boleas, S.; Fernandez, C.; Beyer, J.; Tarazona, J. V.; Goksoyr, A. **Accumulation and effects of benzo[a]pyrene on cytochrome P450 1A in waterborne exposed and intraperitoneal injected juvenile turbot (*Scophthalmus maximus*).** *Marine Environmental Research*. 1998; 46 (1/5):17-20. ISSN: 0141-1136.
Bile fluorescence was found to be a more sensitive biomarker of benzo[a]pyrene exposure in juvenile turbot (*Scophthalmus maximus*) than EROD activity and CYP1A measurement.
- Boonchan, S.; Britz, M.L.; Stanley, G.A. **Surfactant-enhanced biodegradation of high molecular weight polycyclic aromatic hydrocarbons by *Stenotrophomonas maltophilia*.** *Biotechnology and Bioengineering*. August 20, 1998; 59 (4):482-494. ISSN: 0006-3592.
- Bowman, T.D.; Schempf, P.F.; Hodges, J.I. **Bald eagle population in Prince William Sound after the Exxon Valdez oil spill.** *Journal of Wildlife Management*. July 1997; 61 (3):962-967. ISSN: 0022-541X.
Bald eagle population surveys were done by air of the islands in Prince William Sound in 1989-91 and in 1995. It was determined that the bald eagle populations returned to it's pre-spill proportions by 1995.
- Bue, B.G.; Sharr, S.; Seeb, J.E. **Evidence of damage to pink salmon populations inhabiting Prince William Sound, Alaska, two generations after the Exxon Valdez oil spill.** *Transactions of the American Fisheries Society*. January 1998; 127 (1):35-43. ISSN: 0002-8487.
Gametes were taken from salmon returning to oil contaminated and uncontaminated streams and crossed and hatched under controlled conditions. Only the embryos from the oil contaminated streams showed significantly increased mortality.
- Bue, Brian G.; Sharr, Samuel; Seeb, James E. **Evidence of damage to Pink Salmon populations inhabiting Prince William Sound, Alaska, two generations after the Exxon Valdez Oil Spill.** *Transactions of the American Fisheries Society*. 1998; 127 (1):35-43. ISSN: 0002-8487.
Pink salmon embryo mortality was found to be very high due to the oil spill.
- Burger, J.; Tsipoura, N. **Experimental oiling of sanderlings (*Calidris alba*): Behavior and weight changes.** *Environmental Toxicology and Chemistry*. June 1998; 17 (6):1154-1158. ISSN: 0730-7268.
Fresh and weathered oil was applied to the belly feathers of sanderlings to equate 20% plumage oiling. Control birds were wiped with clean swabs. Oiled birds spent more time preening and spreading the oil on their feathers, and less time eating and resting, than the un-oiled birds.
- Camphuysen, K. **Beached bird surveys indicate decline in chronic oil pollution in the North Sea.** *Marine Pollution Bulletin*. July 1998; 36 (7):519-526. ISSN: 0025-326X.
Using the number of beached, oil-contaminated birds as an indicator of oil pollution offshore, there appears to be a decline in the amount of oil pollution in the North Sea. Oil contamination rates tended to be species specific, with swimming birds exhibiting high oiled rates, and flying birds exhibiting lower oiled rates.
- Camus, Lionel; Aas, Endre; Børseth, Jan Fredrik. **Ethoxyresorufin-O-deethylase activity and fixed wavelength fluorescence detection of PAHs metabolites in bile in turbot (*Scophthalmus maximus L.*) exposed to a dispersed topped crude oil in a continuous flow system.** *Marine Environmental Research*. 1998; 46 (1/5):29-32. ISSN: 0141-1136.
Fixed wavelength fluorescence detection of PAH metabolites in juvenile turbot (*Scophthalmus maximus L.*) bile is thought to be a more sensitive biomarker than EROD activity in situations of long term exposure to sublethal concentrations of oil.

- Carls, M.G., et al. **Expression of viral hemorrhagic septicemia virus in prespawning Pacific herring (*Clupea pallasii*) exposed to weathered crude oil.** *Canadian Journal of Fisheries and Aquatic Sciences*. October 1998; 55 (10):2300-2309. ISSN: 0706-652X. Adult Pacific herring were captured and exposed to weathered crude oil for 16-18 days. Total PAH concentration and prevalence of viral hemorrhagic septicemia virus correlated strongly with histopathologic lesions.
- Carlson, P.W.; Barnes, E. C. **Morphology of bottom sediment of Prince William Sound along the oil spill trajectory.** P.R. Carlson *Sediment of Prince William Sound, beach to deep fjord floor, a year after the Exxon Valdez spill.*. Fairbanks, AK: Alaska Division of Geology and Geophysics Survey; 1991.
- Cavenagh, A. **Greenpeace tries to obstruct oil licences.** *Oceanographic Literature Review*. 1998; 45 (3):583. ISSN: 0967-0653.
Greenpeace is in pursuit of a judicial review to disrupt oil and gas field development in a rare coral region. Licenses that were illegally issued by the government are the grounds for the review as well as the issue of the governments failure to consider its duty to protect the rare coral.
- Choiseul, V.; Wilson, J. G.; Nixon, E. **The distribution of hydrocarbons on the east and south-west Irish coasts and in the Liffey Estuary.** *Biology and Environment: Proceedings of the Royal Irish Academy*. 1998; 98B (2):75-86. ISSN: 0791-7945. *Mytilus edulis* and surface sediments were used as environmental indicators to determine the nature and spatial distribution of hydrocarbons in several Irish coastal and estuarine sites. Hydrocarbon concentrations varied from below the detection limit to chronic petroleum contamination in estuarine areas subject to anthropogenic activity. Mussels were the most effective indicators of hydrocarbon pollution at the Laffey estuary site where the sediments were heavily contaminated.
- Clarke, K.R.; Warwick, R.M. **Quantifying structural redundancy in ecological communities.** *Oecologia*. January 1998; 113 (2):278-289. ISSN: 0029-8549. In cases of both natural and human environmental variability on community composition, remarkably high structural redundancy was measured. The *Amoco-Cadiz* oil spill site was used for testing the effects of human environmental variability.
- Cleveland, L.; Little, E. E.; Calfee, R. D.; Barron, M. G. **Photoenhanced toxicity of weathered oil to *Mysidopsis bahia*.** *Aquatic Toxicology*. 2000; 49 (1/2):63-76. ISSN: 0166-445X.
This study found that ultraviolet light increases the toxicity of weathered oil, as seen in the mortality rates of *Mysidopsis bahia* during controlled experiments.
- Cohn, Jeffrey P. **Understanding sea otters: Exxon Valdez oil spill engenders research that sheds light on these cute, cuddly creatures.** *BioScience*. 1988; 48 (3):151-154. ISSN: 0006-3568.
In areas where there have been oil spills such as the *Exxon Valdez*, the number and size of sea urchins greatly increases due to absence of sea otters.
- Copley, J. **Squeaky clean - magnets could help wildlife recover from oil slicks.** *New Scientist*. 1999; 162 (2184):11. ISSN: 0262-4079.
Researchers tested techniques by using iron powder for the removal of different grades of crude oil coated from duck feathers. Combining the feathers with a magnet removes the oil as well as the iron. Depending on the grade of oil, test results showed that 97 percent of the contaminants were removed quickly and effectively.
- Cranford, P.J.; Gordon, D. C.; Lee, K.; Armsworthy, S. L.; Tremblay, G. H. **Chronic toxicity and physical disturbance effects of water- and oil-based drilling fluids and some major constituents on adult sea scallops (*Placopecten magellanicus*).** *Marine Environmental Research*. 1999; 48 (3):225-256. ISSN: 0141-1136.
A laboratory experiment was conducted to examine the effects of water and oil-based drilling fluids and some major constituents on the adult sea scallop, (*Placopecten magellanicus*). Results show that chronic intermittent exposure of sea scallops to dilute concentrations of operational drilling wastes, characterized by acute lethal tests, are practically non-toxic, but can affect growth, reproductive success and survival.
- Curran, P.M.T.; Gillespie, D.K.; Omuircheartaigh, I.G. **The effects of oil spill dispersants on conidial germination and ultrastructure in the marine fungus (*Zalerion maritimum*).** *Botanica Marina*. July 1997; 40 (4):359-367. ISSN: 0006-8055.

- Dauvin, J. C. **The fine sand *Abra alba* community of the Bay of Morlaix twenty years after the *Amoco Cadiz* oil spill.** *Marine Pollution Bulletin*. September 1998; 36 (9):669-676. ISSN: 0025-326X.
Studies made of the fine sand *Abra alba* community over the 19 years since the *Amoco Cadiz* oil spill have shown that areas contaminated by oil spills need to be monitored for more than 10 years after the spills to determine the real ecological impact of the spill on the communities. It took more than 10 years for this community to reconstitute itself.
- Dauvin, J.-C. **The muddy fine sand *Abra alba-Melinna palmata* community of the bay of Morlaix twenty years after the *Amoco Cadiz* oil spill.** *Marine Pollution Bulletin*. 2000; 40 (6):528-536. ISSN: 0025-326X.
The author draws on twenty years of data from the bay of Morlaix to conclude that the effects of the oil spill from the *Cadiz* weakly affected the *Abra alba-Melinna palmata* community. Two distinct post-spill periods are demonstrated: the establishment of *Lanice conchilega* (1978-1984), and the incremental replacement by *Clymenura clypeata* (1985-1996) in the bay. Production/biomass ratios of the community are demonstrated over time, and then compared with other areas more adversely affected by the spill.
- Day, R. H., et al. **Effects of the *Exxon Valdez* oil spill on habitat use by birds along the Kenai peninsula, Alaska.** *Condor*. August 1997; 99 (3):728-742. ISSN: 0010-5422.
Thirty-four species of marine-oriented birds along the Kenai Peninsula were surveyed from 1989-1991. After the *Exxon Valdez* spill, twenty-two species showed no significant changes in habitat use while twelve species did show significant negative impacts in habitat use.
- Dean, Thomas A., et al. **Eelgrass (*Zostera marina* L.) in Prince William Sound, Alaska: effects of the *Exxon Valdez* Oil Spill.** *Marine Pollution Bulletin*. 1998; 36 (3):201-210. ISSN: 0025-326X.
Eelgrass beds at oiled and reference sites were tested between 1990 and 1995. The eelgrass sustained only slight damage due to oiling, and the damage did not persist more than one year after the spill.
- deHaro, A.; et al. **Phytoremediation of the polluted soils after the toxic spill of the *Aznalcollar* mine by using wild species collected *in situ*.** *Fresenius Environmental Bulletin*. 2000; 19 (5/6):275-280. ISSN: 1018-4619.
- Delille, D.; Basseres, A.; Dessommes, A.; Rosiers, C. **Influence of daylight on potential biodegradation of diesel and crude oil in Antarctic seawater.** *Marine Environmental Research*. April 1998; 45 (3):249-258. ISSN: 0141-1136.
Diesel fuel and Arabian light crude oil were added to covered and non-covered batches of Antarctic coastal bacterial communities. The bacteria responded positively, and increased greatly in number, in response to the addition of crude oil both in the presence of light, and in darkness. The diesel fuel had a toxic effect on the bacteria.
- DouAbul, A. A. Z.; Heba, H. M. A.; Fareed, K. H. **Polynuclear Aromatic Hydrocarbons (PAHs) in fish from the Red Sea Coast of Yemen.** *Oceanographic Literature Review*. June 1998; 45 (6):1027. ISSN: 0967-0653. The presence of PAHs in the sediments is not suspected to be the cause of recent fish kills, but the high concentrations of carcinogenic chrysene present in the fish are considered a serious human health hazard.
- Drilling operations threaten Beaufort Sea Whales.** *Marine Pollution Bulletin*. September 1997; 34 (9):684. ISSN: 0025-326X.
NOAA is proposing to authorize five and a half months of oil and gas explorations in Camden Bay, AK.
- Duxbury, C. L.; Dixon, D. G.; Greenberg, B. M. **Effects of simulated solar radiation on the bioaccumulation of polycyclic aromatic hydrocarbons by the duckweed *Lemna gibba*.** *Environmental Toxicology and Chemistry*. August 1997; 16 (8):1739-1748. ISSN: 0730-7268.
- Edgara, Graham J.; Barrett, Neville S. **Impact of the *Iron Baron* oil spill on subtidal reef assemblages in Tasmania.** *Marine Pollution Bulletin*. 2000; 40 (1):36-49. ISSN: 0025-326X.
The physical grounding of the bulk carrier *Iron Baron* caused complete destruction of a subtidal reef community within a localized area of approximately 170 m by 20 m on Hebe Reef in northern Tasmania. The biological impact of the grounding was assessed by using quantitative underwater censuses at numerous reef sites before and after the spill. Post-impact monitoring of the grounding zone and adjacent reference sites on Hebe Reef were assessed for recovery of fish, plant and invertebrate assemblages using species composition and species richness.

- El-Dib, M. A.; Abou-Waly, H. F.; El-Naby, A. M. H. **Impact of fuel oil on the freshwater alga (*Selenastrum capricornutum*)**. *Bulletin of Environmental Contamination and Toxicology*. September 1997; 59 (3):438-444. ISSN: 0007-4861.
A sensitive species of unicellular green algae was evaluated based on Chlorophyll (a) content, growth rate (u/d), effective concentration (EC50), carbohydrate and protein contents as indications of oil pollution impact.
- Elston, R. A.; Drum, A. S.; Pearson, W. H.; Parker, K. **Health and condition of Pacific herring (*Clupea pallasii*) from Prince William Sound, Alaska, 1994**. *Diseases of Aquatic Organisms*. November 20, 1997; 31 (2):109-126. ISSN: 0177-5103.
Studies revealed that no toxic conditions in pacific herring could be attributed to the *Exxon Valdez* oil spill that occurred in 1989. Conditions previously associated with oil exposure in fish (vacuolation in liver cells and the liver melanomacrophage index) varied greatly in the herring.
- Epstein, N.; Bak, R. P. M.; Rinkevich, B. **Toxicity of third generation dispersants and dispersed Egyptian crude oil on Red Sea coral larvae**. *Marine Pollution Bulletin*. 2000; 40 (6):497-503. ISSN: 0025-326X.
The use of third generation dispersants resulted in a marked increase in toxicity among Red Sea coral larvae, and lead to morphological deformations, abnormal swimming behavior, and rapid tissue degeneration. The authors suggest that chemical dispersion should not be used for oil spills near coral reefs.
- Ewald, G., et al. **Biotransport of organic pollutants to an inland Alaska lake by migrating sockeye salmon (*Oncorhynchus nerka*)**. *Arctic*. March 1998; 51 (1):40-47. ISSN: 0004-0843.
- Ferguson, P. L.; Chandler, G. T. **A laboratory and field comparison of sediment polycyclic aromatic hydrocarbon bioaccumulation by the cosmopolitan estuarine polychaete *Streblospio benedicti* (Webster)**. *Marine Environmental Research*. May-June 1998; 45 (4/5):387-401. ISSN: 0141-1136.
Biota-sediment accumulation factors (BSAFs) decreased with increasing PAH concentrations in worms collected from field sediments, but the BSAFs increased with increasing PAH hydrophobicity in worms collected in spiked sediment. It is believed that this disparity may have been caused by insufficient spiked-sediment equilibration time.
- Fisk, A. T.; Norstrom, R. J.; Cymbalisky, C. D.; Muir, D. C. G. **Dietary accumulation and depuration of hydrophobic organochlorines: Bioaccumulation parameters and their relationship with the octanol/water partition coefficient**. *Environmental Toxicology and Chemistry*. May 1998; 17 (5):951-961. ISSN: 0730-7268.
- Flemer, D. A.; Ruth, B. F.; Bundrick, C. M.; Gaston, G. R. **Macrobenthic community colonization and community development in dredged material disposal habitats off coastal Louisiana**. *Oceanographic Literature Review*. 1998; 45 (2):389. ISSN: 0967-0653.
The Mermentau and Atchafalaya Rivers and Freshwater Bayou in coastal Louisiana were investigated for data on effects of dredging and disposal on 9 phyla and 51 taxa. It is suspected that frequent natural disturbances account for differences in macrobenthic community structure more than dredged material disposal.
- Flint, P. L.; Fowler, A. C. **A drift experiment to assess the influence of wind on recovery of oiled seabirds on St. Paul Island, Alaska**. *Marine Pollution Bulletin*. February 1998; 36 (2):165-166. ISSN: 0025-326X.
Using wooden blocks distributed off St. Paul Island following a near-shore oil spill during onshore wind periods and offshore wind periods, the researchers were able to obtain information about recovery of oiled seabirds. Due to the extremely low recovery (0.7%) of the blocks released during offshore winds, researchers concluded that most of the birds killed in the 1996 spill were not recovered.
- Forrester, D. J., et al. **Winter mortality of common loons in Florida coastal waters**. *Journal of Wildlife Diseases*. October 1997; 33 (4):833-847. ISSN: 0090-3558.
Of 434 common loons (*Gavia immer*) found sick or dead on Florida beaches from 1970 through 1994, 18% were affected by oiling. Other causes of death examined were emaciation syndrome, aspergillosis, trauma and miscellaneous disease entities.
- Fowler, A. C.; Flint, P. L. **Persistence rates and detection probabilities of oiled King Eider carcasses on St. Paul Island, Alaska**. *Oceanographic Literature Review*. 1998; 45 (2):386. ISSN: 0967-0653.
King Eider (*Somateria spectabilis*) carcass persistence rates varied based on scavenging, wave action, weather, shore type, and sex of carcasses.

Friedmann, B. R.; Shutty, K. M. **Effect of timing of oil film removal and first feeding on swim bladder inflation success among intensively cultured striped bass larvae.** *North American Journal of Aquaculture*. 1999; 61 (1):43-46. ISSN: 1522-2055. Swim bladder inflation in tensely cultured-stripped bass is an important developmental step that occurs during the first 2 weeks of larval life. Using oil removal procedures as a controllable factor resulted in high inflation success among the cultured striped bass.

Frost, K. J.; Lowry, L. F. ; VerHoef, J. M. **Monitoring the trend of harbor seals in Prince William Sound, Alaska, after the Exxon Valdez oil spill.** *Marine Mammal Science*. 1999; 15 (2):494-506. ISSN: 0824-0469.

Aerial survey counts were used to monitor the numbers of harbor seals, (*Phoca vitulina richardsi*) in Prince William Sound, Alaska, following the 1989 Exxon Valdez oil spill. Repetitive counts were used from 25 haul-out sites. A generalized linear model, showed regression and unadjusted counts were factors in determining the accuracy of the monitoring program.

Fuentes, F. A.; Santodomingo, J. W.; Hazen, T. C. **Survival of *Candida albicans* and *Pseudomonas aeruginosa* in oil polluted tropical coastal waters.** *Water Research*. July 1998; 32 (7):2154-2170. ISSN: 0043-1354.

Membrane diffusion chambers were used for *in situ* study of organisms at sites in the Yabucoa Bay off the east coast of Puerto Rico. Significant decreases in cell density and total activity over a three-day study period were observed, however respiration and ATP content per organism remained the same. Violent agitation of sediments by oil tanker traffic may have played a role in increasing the ambient phosphorus useful for microbial survival.

Furness, R. W.; Camphuysen, C. J. **Seabirds as monitors of the marine environment.** *Ices Journal of Marine Science*. August 1997; 54 (4):726-737. ISSN: 1054-3139.

Among other topics discussed is the use of seabirds as oil pollution monitors. North Sea oil releases have significantly declined over the last 15 years. Oil found on birds can be fingerprinted to identify its source.

Garcia, E. M.; Siegert, I. G.; Suarez, P. **Toxicity assays and naphthalene utilization by natural bacteria selected in marine environments.** *Bulletin of Environmental Contamination and Toxicology*. September 1998; 61 (3):370-377. ISSN: 0007-4861. The toxicity of naphthalene was tested on marine bacterial strains from pristine environments as well as from PAH contaminated areas. The bacteria from the previously contaminated areas showed greater adaptation response than those from less polluted environments.

Garshelis, D. L. **Sea otter mortality estimated from carcasses collected after the oil spill.** *Conservation Biology*. August 1997; 11 (4):905-916. ISSN: 0888-8892.

Mortality estimates were made factoring in three areas that had previously not been considered: dying otters found on shore, carcasses collected at sea and differences in search efforts in different areas of the spill.

Gilewicz, M.; et al. **Isolation and characterization of a marine bacterium capable of utilizing 2-methylphenanthrene.** *Applied Microbiology and Biotechnology*. October 1997; 48 (4):528-533. ISSN: 0175-7598.

Goksoyr, A.; et al. **Biomarker responses in flounder (*Platichthys flesus*) and their use in pollution monitoring.** *Marine Pollution Bulletin*. 1996; 33 (1/6):36-45. ISSN: 0025-326X.

Flounder were collected from non-contaminated sites off Southern Norway, place into contaminated tanks for two weeks. The flounder were found to be good indicator species, although it is advised not to use them during spawning season as the influence of reproduction obscures the wanted biomarker responses.

Gulec, Ismail; Leonard, Brian; Holdway, Douglas A. **Oil and dispersed oil toxicity to amphipods and snails.** *Spill Science & Technology*. 1997; 4 (1):1-6. ISSN: 1353-2561.

Dispersed oil combinations were found to be significantly more toxic than crude oil to the amphipods and snails in temperate inshore Australian waters, suggesting that chemical dispersion not be used as a means of remediation.

Gunnarsson, J. S., et al. **Interactions between eutrophication and contaminants. III. Mobilization and bioaccumulation of benzo[a]pyrene from marine sediments.** *Marine Pollution Bulletin*. 1996; 33 (1/6):80-89. ISSN: 0025-326X.

This study sought to understand how eutrophication processes act on the distribution and bioavailability of pollutants to benthic organisms. Benthic organisms selectively feeding on labile organic matter is considered a major exposure route of organic pollutants.

Hart, L. J., et al. **Subacute immunotoxic effects of the polycyclic aromatic hydrocarbon 7,12-dimethylbenzanthracene (DMBA) on spleen and pronephros leukocytic cell counts and phagocytic cell activity in tilapia (*Oreochromis niloticus*).** *Aquatic Toxicology*. March 1998; 41 (1/2):17-29. ISSN: 0166-445X.

The study indicated that total leukocyte counts from tilapia spleen and pronephros were more sensitive PAH exposure indicators than phagocytic activity.

Hegazy, A. K. **Plant succession and its optimization on tar-polluted coasts in the Arabian Gulf region.** *Oceanographic Literature Review*. 1998; 45 (3):546. ISSN: 0967-0653.

Plant colonization and communities around and on tar-piles formed from depositing tar from the Arabian Gulf in the coastal marshes was studied. A management and restoration plan was proposed, as well as suggestions offered for specific plant species to be used in restoration.

Hinkle-Conn, C.; Fleeger, J. W.; Greg, J. C.; Carman, K. R. **Effects of sediment-bound polycyclic aromatic hydrocarbons on feeding behavior in juvenile spot (*Leiostomus xanthurus lacedpede*: Pisces).** *Journal of Experimental Marine Biology and Ecology*. 1998; 227 (1):113-132. ISSN: 0022-0981.

The juvenile spot did not avoid feeding in moderated or high PAH contaminated soils.

Horness, B. H., et al. **Sediment quality thresholds: estimates from hockey stick regression of liver lesion prevalence in English sole (*Pleuronectes vetulus*).** *Environmental Toxicology and Chemistry*. May 1998; 17 (5):872-882. ISSN: 0730-7268.

Statistically significant chemical thresholds of biological effects were estimated for hepatic lesion prevalences in English sole in relation to sediment concentrations of PAHs, and the thresholds are notably lower than many established using other techniques.

Huffman, S. **The effects of oil on mallards (*Anas platyrhynchos*).** *The Texas Journal of Science*. 1999; 51 (2):181-190. ISSN: 0040-4403.

There is little knowledge concerning the long-term survivability of wildlife that has endured and survived oiling from spills. This study presents analysis that determined if permanent damage to liver & kidney functions occurred over time.

Hufnagle, L. C., et al. **Development and application of a high-performance liquid chromatography screening method for aromatic compounds in invertebrate tissues.** *Archives of Environmental Contamination and Toxicology*. 1999; 37 (2):220-226. ISSN: 0090-4341.

Bivalve samples taken from Alaska and Puget Sound were measured for naphthalene, phenanthrene, and benzo[a]pyrene equivalents to validate the high-performance liquid chromatography screening method, and then compared to detailed analyses obtained by GC/MS method.

Hull, C. L., et al. **The efficacy of translocating little penguins (*Eudyptula minor*) during an oil spill.** *Biological Conservation*. December 1998; 86 (3):393-400. ISSN: 0006-3207.

Translocation of *Eudyptula minor* to a non-contaminated site after a fuel oil spill from the Iron Baron at Low Head, Tasmania, proved to be a successful experiment.

Hylland, K.; Nissen-Lie, T.; Christensen, P. G.; Sandvik, M. **Natural modulation of hepatic metallothionein and cytochrome P4501A in Flounder, *Platichthys flesus* L.** *Marine Environmental Research*. 1998; 46 (1/5):51-55. ISSN: 0141-1136.

Season, gender and maturation factors accounted for 50-60% of the total variability of Hepatic CYP1A activity (EROD) and metallothionein and metal concentrations in the flounder tested. External lesions should also be taken into account to a lesser degree as a biomarker-monitoring factor.

Jager, T.; Sanchez, F. A.; Muijs, B.; Vander-Velde, E. G.; Posthuma, L. **Toxicokinetics of polycyclic aromatic hydrocarbons in *Eisenia andrei* (Oligochaeta) using spiked soil.** *Environmental Toxicology and Chemistry*. 2000; 19 (4, Part 1):953-961. ISSN: 0730-7268.

In a spiked artificial soil medium, the accumulation of four polycyclic aromatic hydrocarbons; phenanthrene, pyrene, fluoranthene, and benzo[a]pyrene were tested in the earthworm *Eisenia andrei* over a seven day period. Results of this study indicate that using a standard PAH accumulation experiment (where the worms are only analyzed after several weeks' exposure) would produce misleading results.

- Jewett, S. C.; Dean, T. A.; Smith, R. O.; Blanchard, A. **Exxon Valdez oil spill: impacts and recovery in the soft-bottom benthic community in and adjacent to eelgrass beds.** *Marine Ecology Progress Series*. 1999; 185:59-83. ISSN: 0171-8630
Benthic communities within and adjacent to eelgrass beds in Prince William Sound, Alaska, were used to assess impacts from the Exxon Valdez oil spill. The concentration of TPAHs, benthic community composition, diversity, biomass, and abundance were compared between matched pairs of oiled and reference sites in 1990, 1991, 1993, and 1995, respectively.
- Johnson, S. W., et. al. **Reproductive success of Pacific herring, *Clupea pallasii*, in Prince William Sound, Alaska, six years after the Exxon Valdez oil spill.** *Fishery Bulletin*. October 1997; 95 (4):748-761. ISSN: 0090-0656.
In 1995, herring were collected from 4 sites in Prince William Sound and from three uncontaminated sites in southeast Alaska. No evidence of reproductive impairment among any of the year classes was found.
- Jones, David A., et al. **Long-term (1991-1995) monitoring of the intertidal biota of Saudi Arabia after the 1991 Gulf War oil spill.** *Marine Pollution Bulletin*. 1998; 36 (6):472-489. ISSN: 0025-326X.
By 1995, species diversity along the upper shore levels of the Saudi Arabian Gulf had returned to normal, and species diversity along the lower shore levels was greater than 70% of normal. Individual species abundance also increased over the 4 years after the spill.
- Kaag, N. H.; Scholten, M. C. T.; Vanstraelen, N. M. **Factors affecting PAH residues in the lugworm (*Arenicola marina*), a sedimet feeding polychaete.** *Journal of Sea Research*. December 1998; 40 (3/4):251-261. ISSN: 1385-1101.
Samples of lugworms were taken along a contamination gradient in the Western Scheldt estuary, Netherlands for 15 months. Body residue levels of PAHs in the worms were lowest in March and highest right before spawning in September, with a marked decrease during spawning. The contamination gradient was evident in the body residue levels.
- Khan, R. A. **Study of pearl dace (*Margariscus margarita*) inhabiting a stillwater pond contaminated with diesel fuel.** *Bulletin of Environmental Contamination and Toxicology*. 1999; 62 (2):638-645. ISSN: 0007-4861.
A number of bioindicators were used to assess stress in pearl dace exposed to diesel fuel. The K-factor, a reflection of body condition was significantly greater at the impacted location than in samples from a reference site.
- Kirby, M. F.; Blackburn, M. A.; Thain, J. E.; Waldock, M. J. **Assessment of water quality in estuarine and coastal waters of England and Wales using a contaminant concentration technique.** *Marine Pollution Bulletin*. August 1998; 36 (8):631-642. ISSN: 0025-326X.
It was found that hydrocarbons may make a significant contribution to the toxicity of estuarine and coastal waters, but the cause of the majority of the toxic response has not been identified.
- Kireeva, N. A.; Novoselova, E. I.; Khaziev, F. K. **Enzymes of nitrogen metabolism in soil polluted with oil.** *Izvestiya Akademii Nauk Seriya Biologicheskaya*. November-December 1997; (6):755-759. ISSN: 0002-3329.
- Kirso, U.; Irha, N. **Role of algae in fate of carcinogenic polycyclic aromatic hydrocarbons in the aquatic environment.** *Ecotoxicology and Environmental Safety*. September 1998; 41 (1):83-89. ISSN: 0147-6513.
- Kleinow, K. M.; James, M. O.; Tong, Z.; Venugopalan, C. S. **Bioavailability and biotransformation of benzo[a]pyrene in an isolated perfused *in situ* catfish intestinal preparation.** *Environmental Health Perspectives*. March 1998; 106 (3):155-166. ISSN: 0091-6765.
- Kuletz, K. J.; Kendall, S. J. **A productivity index for marbled murrelets in Alaska based on surveys at sea.** *Journal of Wildlife Management*. April 1998; 62 (2):446-460. ISSN: 0022-541X.
- Lancaster, J. E.; Pawsons, M. G.; Pickett, G. D.; Jennings, S. **The impact of the 'Sea Empress' oil spill on seabass recruitment.** *Marine Pollution Bulletin*. September 1998; 36 (9):677-688. ISSN: 0025-326X.
Post-larval sea bass (*Dicentrarchus labrax L.*) were collected in the Bristol Channel during 1996 to examine the effects of the Sea Empress oil spill on their growth and survival. The seabass found at sample sites along the north coast of the Bristol Channel tended not to reach the critical length for survival through their first winter.
- Landrum, P. F.; Gossiaux, D. C.; Kukkonen, J. **Sediment characteristics influencing the bioavailability of nonpolar organic contaminants to *Diporeia spp.*** *Chemical Speciation and Bioavailability*. 1997; 9 (2):43-55. ISSN: 0954-2299.
- Latyshev, N. A.; Kusakin, O. G.; Svetashev, V. I.; Kiyashko, S. I. **Food pattern of different littorine species in the antropogonically oil-polluted environment determined using lipid and isotope markers.** *Doklady Akademii Nauk*. 1999; 366 (5):715-717. ISSN: 0869-5652.

- Law, R. J.; Kelly, C. A.; Nicholson, M. D. **Polycyclic aromatic hydrocarbons (PAH) in shellfish affected by the *Sea Empress* oil spill in Wales in 1996.** *Polycyclic Aromatic Compounds*. 1999; 17 (1/4):229-239. ISSN: 1040-6638.
- Lebedev, A. T., et al. **The contamination of birds with organic pollutants in the Lake Baikal region.** *Science of the Total Environment*. April 8, 1998; 212 (2/3):153-162. ISSN: 0048-9697.
- Lee, R. F.; Page, D. S. **Petroleum hydrocarbons and their effects in subtidal regions after major oil spills.** *Marine Pollution Bulletin*. November 1997; 34 (11):928-940. ISSN: 0025-326X.
It is estimated that between 1 and 13% of spilled oil enters the subtidal zone. Documented biological effects of oil that enters the subtidal zone are short-lived and is recovered rapidly.
- Leppanen, M. T.; Kukkonen, J. V. K. **Effect of sediment-chemical contact time on availability of sediment-associated pyrene and benzo[a]pyrene to oligochaete worms and semi-permeable membrane devices.** *Aquatic Toxicology*. 2000; 49 (4):227-241. ISSN: 0166-445X.
Feeding and non-feeding oligochaetes were subjected to polluted lake sediments in five consecutive experiments. In addition, semi-permeable membrane devices (SPMDs) were tested by mimicking the accumulation of sediment-associated chemicals by benthic invertebrates in five consecutive tests to determine the effect of aging of sediment on accumulation. The aging of sediment decreased availability of PAHs to both organisms and SPMDs. Semi-permeable membrane devices may also successfully mimic uptake by non-feeding organisms.
- Leu, J. Y.; McGovern-Traa, C. P.; Porter, A. J.; Hamilton, W. A. **The same species of sulphate-reducing *Desulfomicrobium* occur in different oil field environments in the North Sea.** *Letters in Applied Microbiology*. 1999; 29 (4):246-252. ISSN: 0266-8254.
In this study, the presence of sulphate-reducing bacteria (SRB) in oil field samples from the North Sea was investigated. This study finds that the microorganisms *Desulfomicrobium* were found in four different samples from two distant North Sea oil fields, and suggests they are likely to be widespread throughout other oil field systems. With their wide range of salinity and temperature tolerance, these microorganisms play an important role in the generation of sulphide.
- Lindau, C. W.; Delaune, R. D. **Vegetative response of *Sagittaria lancifolia* to burning of applied crude oil.** *Water Air and Soil Pollution*. 2000; 121 (1/4):161-172. ISSN: 0049-6979.
South Louisiana crude oil was sprayed on *Sagittaria lancifolia* to evaluate its sensitivity to *in-situ* burning. This remediation method suggests that it may be viable to use this rapid response technique in order to remove oil and to control the oil migration to sensitive areas.
- Lindeman, K. C.; Synder, D. B. **Nearshore hardbottom fishes of southeast Florida and effects of habitat burial caused by dredging.** *Fishery Bulletin*. 1999; 97 (3):508-525.
Random transects of fish assemblages of nearshore hardbottom habitats of southeast Florida were quantified at three sites from April 1994 to June 1996. Eighty-six taxa (77 identified to species) from 36 families were censused. The hardbottom at one site was buried by a dredge project to widen a beach one year into the study. Burial of approximately five ha of hardbottom habitat at the dredge site lowered the numbers of individuals and species by over 30x and 10x, respectively.
- Lindley, J. A.; George, C. L.; Evans, S. V.; Donkin, P. **Viability of calanoid copepod eggs from intertidal sediments: a comparison of three estuaries.** *Marine Ecology - Progress Series*. 1998; 162:183-190. ISSN: 0171-8630.
Nauplii from three estuaries were sampled. Two of the sites sustained much urban and industrial pollution, while the third site was subject to low levels of urban and agricultural pollution. PAH concentrations in the soil samples of the third site were much lower than the other two, and many more nauplii hatched at this site than at the others.
- Lloyd-Jones, G.; Lau, P. C. K. **Glutathione S-transferase-encoding gene as a potential probe for environmental bacterial isolates capable of degrading polycyclic aromatic hydrocarbons.** *Applied and Environmental Microbiology*. August 1997; 63 (8):3286-3290. ISSN: 0099-2240.
A GST gene in *Sphingomonas spp.*, isolated from samples taken in New Zealand and the United States, was found to be a potentially useful marker.
- Lockhart, W. L., et al. **Chronic toxicity of the 'water-soluble fraction' of Norman Wells crude oil to juvenile fish.** *Spill Science & Technology Bulletin*. 1996; 3 (4):259-262. ISSN: 1353-2561.
Young rainbow trout mortality increased rapidly with increasing exposure levels to Norman Wells crude oil, and was exacerbated by the addition of oil dispersants. The mean body water content of the few fish that survived the 55-day experiment had increased by greater than 6%.

- Lopes, C. F., et al. **Coastal monitoring program of Sao Sebastiao Channel: assessing the effects of 'TEBAR V' oil spill on rocky shore populations.** *Marine Pollution Bulletin*. November 1997; 34 (11):923-927. ISSN: 0025-326X.
The high toxicity levels of oil did not significantly alter the density of the populations.
- MacCarone, A. D.; Brzorad, J. N. **The use of foraging habitats by wading birds seven years after the occurrence of major oil spills.** *Colonial Waterbirds*. 1999; 21 (3):367-374. ISSN: 0738-6028.
In 1990 a series of accidental discharges released almost five million L. of oil into the Arthur Kill estuary, located between New York and New Jersey. In May of 1997, a repeated study of the Arthur Kill estuary became the focus of a long-term research project. A total of 116 hours of observations were used to determine whether the number of wading birds from a nearby breeding colony had returned to the former estuarine feeding site, largely abandoned in 1990 after the series of oil spills.
- MacNaughton, Sarah J., et al. **Microbial population changes during bioremediation of an experimental oil spill.** *Applied and Environmental Microbiology*. 1999; 65 (8):3566-3574. ISSN: 0099-2240.
A randomized block field experiment was set up simulating a coastal oil spill, and three crude oil bioremediation techniques were applied. During this experiment, bacterial community members were monitored for their progress of bioremediation of the site and to define an end point for the removal of hydrocarbon substrates. Results were used to determine how the degrading and nondegrading communities change during the course of the experiment. Communities returning to pre-spill conditions would strongly indicate the site was restored and that cleanup activities could cease.
- Majcherczyk, A.; Johannes, C.; Huttermann, A. **Oxidation of polycyclic aromatic hydrocarbons (PAH) by laccase of *Trametes versicolor*.** *Enzyme and Microbial Technology*. April 1998; 22 (5):335-341. ISSN: 0141-0229.
- Malmstrom, C. M.; Miettinen, S.; Bylund, G. **DNA adducts in liver and leukocytes of flounder (*Platichthys flesus*) experimentally exposed to benzo[a]pyrene.** *Aquatic Toxicology*. 2000; 48 (2/3):177-184. ISSN: 0166-445X.
In this present study, *Platichthys flesus* is used as a biomarker for the continuous assessment of levels of PAH pollutants in the Baltic Sea. A controlled experiment was conducted on the flounder for a period of 10 days following a single injection of two doses of benzo[a]pyrene, to determine the levels of hydrophobic DNA adducts in the liver and in the leukocytes of the flounder.
- Mancha, R.; Diaz, G.; Arese, A. **Prediction of bioaccumulation potential of some aromatic hydrocarbons in indicator species of ecotoxicity.** *Bulletin of Environmental Contamination and Toxicology*. September 1997; 59 (3):422-429. ISSN: 0007-4861.
Bioconcentration factors (BCF) predict chemical residues taken up by small aquatic and terrestrial animals, and can be used to rank the bioaccumulation potential of organic chemicals in the environment.
- Marcogliese, D. J.; Nagler, J. J.; Cyr, D. G. **Effects of exposure to contaminated sediments on the parasite fauna of American plaice (*Hippoglossoides platessoides*).** *Bulletin of Environmental Contamination and Toxicology*. July 1998; 61 (1):88-95. ISSN: 0007-4861.
American plaice were exposed to sediments containing high levels of PAHs and PCBs. No significant changes in abundance of the parasites of the American plaice were noticed.
- Marty, G. D., et al. **Histopathology and cytogenetic evaluation of Pacific herring larvae exposed to petroleum hydrocarbons in the laboratory or in Prince William Sound, Alaska, after the Exxon Valdez oil spill.** *Canadian Journal of Fisheries and Aquatic Sciences*. August 1997; 54 (8):1846-1857. ISSN: 0706-652X.
Pacific Herring (*Clupea pallasii*) larvae were trawled from two oiled sites and two unoiled sites following the Exxon Valdez spill. Effects of oil contamination were observed, and laboratory experiments subjecting unoiled larvae to oil contamination were performed. The results were compared.
- Matter, J. M.; McMurry, C. S.; Anthony, A. B.; Dickerson, R. L. **Development and implementation of endocrine biomarkers of exposure and effects in American alligators (*Alligator mississippiensis*).** *Chemosphere*. October-November 1998; 37 (9/12):1905-1914. ISSN: 0045-6535.
- Mccoy, D. L.; Brown, K. M. **Hydrocarbon pollutants alter short-term recruitment in the barnacle *Balanus eburneus*.** *Marine Environmental Research*. April 1998; 45 (3):209-224. ISSN: 0141-1136.
Oil-treated clay tiles were tested at two coastal and two protected sites along the Louisiana coast for barnacle recruitment. Oil-treated tiles had diminished barnacle recruitment in the first three weeks, but showed no difference from the untreated tiles after six weeks. Barnacle recruitment was generally higher at the exposed, coastal sites.

- McNally, D. L.; Mihelcic, J. R.; Lueking, D. R. **Polycyclic aromatic hydrocarbon degrading microorganisms in Great Lakes sediments.** *Journal of Great Lakes Research.* 1998; 24 (2):392-403. ISSN: 0380-1330. The general biodiversity of microorganisms was greater at the uncontaminated site than at the contaminated site, but the diversity of PAH-degrading biotypes was much greater at the contaminated site than the uncontaminated site.
- Michel, J; Henry, C. B. **Oil uptake and depuration in oysters after use of dispersants in shallow water in El Salvador.** *Spill Science & Technology Bulletin.* 1997; 4 (2):57-70. ISSN: 1353-2561. Oysters were sampled from a spill site of Venezuelan Recon where dispersants had been used in the shallow waters of the site. Samples were collected 1 and 4 weeks after the spill. PAH levels were 147-164 times the background levels one week after the spill, but were reduced by 94-98% by 4 weeks after the spill.
- Middaugh, D. P., et al. **Preliminary observations on responses of embryonic and larval Pacific herring, (*Clupea pallasii*), to neutral fraction biodegradation products of weathered Alaska North Slope oil.** *Archives of Environmental Contamination and Toxicology.* February 1998; 34 (2):188-196. ISSN: 0090-4341. Exposure of the herring eggs to biodegraded weathered oil produced high mortalities or teratogenic responses.
- Miles, A. K.; Roster, N. **Enhancement of polycyclic aromatic hydrocarbons in estuarine invertebrates by surface runoff at a decommissioned military fuel depot.** *Marine Environmental Research.* 1999; 47 (1):49-60 ISSN: 0141-1136.
- Mitchell, F. M.; Holdway, D. A. **The acute and chronic toxicity of the dispersants Corexit 9500 and 9527, water accommodated fraction (WAF) of crude oil, and dispersant enhanced to *Hydra viridissima* (Green hydra).** *Water Research.* 2000; 34 (1):343-348. ISSN: 0043-1354. Corexit 9500 and Corexit 9527 surfactants were used to determine the acute and chronic toxicity to the freshwater organism *Hydra viridissima* during a 7-day population growth rate. Results are discussed.
- Moles, A. **Sensitivity of ten aquatic species to long-term crude oil exposure.** *Bulletin of Environmental Contamination and Toxicology.* 1998; 61 (1):102-107. ISSN: 0749-0208. Long-term toxicity of oil on a wide variety of phyla is evaluated. Two fish species, four crustacean species, one echinoderm species and three mollusk species were examined.
- Moles, Adam; Norcross, Brenda L. **Effects of oil-laden sediments on growth and health of juvenile flatfishes.** *Canadian Journal of Fisheries and Aquatic Sciences.* 1998; 55 (3):605-610. ISSN: 0706-652x. Juvenile flatfishes exposed to sediments laden with Alaska North Slope crude oil showed a reduction in growth of 34-56% and also health bioindicators were increased among the flatfishes. Nearshore nursery sediments exposed to the chronic hydrocarbon pollution could alter growth and health of juvenile flatfishes.
- Monteiro, P. P. R.; Reis-Henriques, M. A.; Coimbra, J. **Polycyclic aromatic hydrocarbons inhibit in vitro ovarian steroidogenesis in the flounder (*Platichthys flesus* L.).** *Aquatic Toxicology.* 2000; 48 (4):549-559. ISSN: 0166-445X. This study focuses on the endocrine disruption of fish reproduction by chemical pollution and evaluates the effects of polycyclic aromatic hydrocarbons on ovarian steroidogenesis of the flounder. Results of the study conclude that polycyclic aromatic hydrocarbons severely inhibited a rate-limiting enzyme for conversion of C21 to C19 steroids, and showed therefore, the potential to disrupt the reproductive cycle of fish living in polluted environments due to impairment of steroid biosynthesis.
- Monteiro, P. P. R.; Reis-Henriques, M. A.; Coimbra, J. **Plasma steroid levels in female flounder (*Platichthys flesus*) after chronic dietary exposure to single polycyclic aromatic hydrocarbons.** *Marine Environmental Research.* 2000; 49 (5):453-467. ISSN: 0141-1136. For a period of 12 weeks, sexually mature feral female flounder were exposed through their diet to PAH's, to determine the chronic effects on ovary development, total hepatic lipids, plasma and corticosteroid levels. Researchers determined that exposure to PAH's did not significantly affect ovary development or hepatic lipids in female flounder (*Platichthys flesus*). However, plasma steroid levels showed significant decreases during the experiments. Selected PAH's may impair the reproductive function of female teleost.
- Moore, C. G.; Stevenson, J. M. **A possible new meiofaunal tool for rapid assessment of the environmental impact of marine oil pollution.** *Cahiers de Biologie Marine.* 1997; 38 (4):277-282. ISSN: 0007-9723.

- Morales, A. E.; et al. **Re-evaluation of crude fiber and acid-insoluble ash as inert markers, alternative to chromic oxide, in digestibility studies with rainbow trout (*Oncorhynchus mykiss*).** *Aquaculture*. 1999; 179 (1/4):71-79. ISSN: 0044-8486.
Apparent digestibility coefficients for crude protein, nitrogen free extract, dry matter and gross energy were higher when acid-insoluble ash was used as a marker compared with Cr₂O₃ for six practical diets. Crude fiber can be effective endogenous marker, although attention should be paid to the type of crude fiber present in the diets.
- Moy, F. E.; Walday, M. **Accumulation and depuration of organic micro-pollutants in marine hard bottom organisms.** *Marine Pollution Bulletin*. 1996; 33 (1/6):56-63. ISSN: 0025-326X.
Algae and mussels were exposed to radio-labeled toxicants in a closed continuous-flow system for 14 days. Uptake was rapid and significant, and toxicants were retained in tissue for long periods.
- Munoz, D., et al. **Long term evolution of petroleum biomarkers in mangrove soil (Guadeloupe).** *Marine Pollution Bulletin*. November 1997; 34 (11):868-874. ISSN: 0025-326X.
Plots of peaty mangrove were polluted and studied over an eight-year period. Biomarkers were found to be useful in following the weathering of petroleum.
- Myers, M S., et al. **Toxicopathic hepatic lesions in subadult English sole (*Pleuronectes vetulus*) from Puget Sound, Washington, USA: relationships with other biomarkers of contaminant exposure.** *Marine Environmental Research*. February 1998; 45 (1):47-67. ISSN: 0141-1136.
Preneoplastic, regenerative, and unique degenerative/necrotic lesions were prevalent in sole tested from contaminated sites, suggesting that these non-neoplastic lesions could be used as indicators of oil pollution.
- Narbonne, J. F.; et al. **Accumulation kinetics of polycyclic aromatic hydrocarbons absorbed to sediment by the mollusk *Corbicula fluminea*.** *Ecotoxicology and Environmental Safety*. 1999; 42 (1/8):1-9.
The kinetics of four PAH uptake with very different physical properties was measured in *Corbicula fluminea*. The rate and mechanism of uptake (from intertidal water or by sediment ingestion) depends on rates of PAH transfer from the sediment to the interstitial water, uptake clearance from the water to the organisms, rate of particle ingestion, and assimilation efficiencies.
- Nascimento, M. G.; et al. **Impaired health in flounder, *Paralichthys spp.* inhabiting coastal Chile.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 64 (2):184-190. ISSN: 0007-4861.
Off the coastline of Central Chile, three embayments are a repository for effluent originating from two municipalities, a fishmeal plant and petroleum hydrocarbons of unknown origin. This study indicates that the health of flounder living in the polluted area is impaired based on macroscopic and microscopic lesion, blood values, condition factor, and organosomatic indices in contrast to reference fish. Biomarkers used in this study were unable to detect specific responses to any one pollutant.
- Nicolotti, G.; Egli, S. **Soil contamination by crude oil: impact on the mycorrhizosphere acid on the revegetation potential of forest trees.** *Environmental Pollution*. 1998; 99 (1):37-43. ISSN: 0269-7491.
Norway spruce and poplar seedlings were grown in oil-contaminated soil. The growth of the poplar seedlings was greatly reduced at high contamination levels. Mycorrhizosphere colonisation of the poplars was not affected by any of the oil concentrations, but certain fungi showed species-specific reactions to increased oil concentrations on soils growing the spruce seedlings.
- Noreña-Barroso Elsa; Gold-Bouchot, Gerardo; Zapata-Perez, Omar; Sericano, José L. **Polynuclear aromatic hydrocarbons in American Oysters *Crassostrea virginica* from the Terminos Lagoon, Campeche, Mexico.** *Marine Pollution Bulletin*. 1999; 38 (8):637-645. ISSN: 0025-326X.
Oysters collected from the Terminos Lagoon, Campeche, Mexico, were found to contain high levels of polynuclear aromatic hydrocarbons in their tissues. A monitoring program in this area is imperative, because of the farming of the oysters for human consumption.
- OConnell, M., et al. **Genetic structuring among Alaskan Pacific herring populations identified using microsatellite variation.** *Journal of Fish Biology*. July 1998; 53 (1):150-163. ISSN: 0022-1112.
Pacific herring (*Clupea pallasii*) were sampled from Kodiak Island, two sites in the Bering Sea, and four sites within Prince William Sound, Alaska. The genetic divergence was greatest between herring from the Bering Sea and Prince William Sound, and could be explained largely by geographic separation.

- Oka, N.; Okuyama, M. **Nutritional status of dead oiled rhinoceros auklets (*Cerorhinca monocerata*) in the southern Japan Sea.** *Marine Pollution Bulletin*. 2000; 40 (4):340-347. ISSN: 0025-326X. Nutritional status was compared between oiled and non-oiled rhinoceros auklets. Investigations revealed that the oiled birds died as a result of nutritional exhaustion associated with attempts to maintain thermoregulation after exposure to oil.
- Okay, O. S.; Donkin, P.; Peters, L. D.; Livingstone, D. R. **The role of algae (*Isochrysis galbana*) enrichment on the bioaccumulation of benzo[a]pyrene and its effects on the blue mussel *Mytilus edulis*.** *Environmental Pollution*. 2000; 110 (1):103-113. ISSN: 0269-7491. *Isochrysis galbana* was exposed to benzo[a]pyrene for a period of 24 hours, and then fed to the common mussel (*Mytilus edulis*) on a daily basis, to determine the role of algal concentration in the transfer of organic contaminants in a food chain.
- Onwurah, I. N. E. **Biochemical oxygen demand exertion and glucose uptake kinetics of *Azotobacter* in crude oil polluted medium.** *Bulletin of Environmental Contamination and Toxicology*. March 1998; 60 (3):464-471. ISSN: 0007-4861. *Azotobacter* was used to determine the short-term effect of Bonny light crude oil on glucose uptake and BOD exertion. It was shown that oil has the tendency to reduce the dissolved oxygen level in aqueous solutions.
- Palittapongarnpim, M.; Pokethitiyook, P.; Upatham, E. S.; Tangbanluekal, L. **Biodegradation of crude oil by soil microorganisms in the tropic.** *Biodegradation*. 1998; 9 (2):83-90. ISSN: 0923-9820. Three bacteria and two yeasts capable of degrading Tapis light crude oil were isolated from contaminated soil in Bangkok, Thailand. The *Candida tropicalis* 15Y strain was the most efficient oil degrader.
- Pearson, T. H.; Mannvik, H. P. **Long-term changes in the diversity and faunal structure of benthic communities in the northern North Sea: natural variability or induced instability?** *Hydrobiologia*. 1998; 376:317-329. ISSN: 0018-8158. Changes in benthic sedimentary communities around oil and gas installations in the northern North Sea have been monitored over the past three decades. It is thought that climatic forces drive broad scale temporal and spatial fluctuations in these communities.
- Pearson, W. H., et al. **Why did the Prince William Sound, Alaska, Pacific herring (*Clupea pallasii*) fisheries collapse in 1993 and 1994? Review of hypotheses.** *Canadian Journal of Fisheries and Aquatic Sciences*. 1999; 56 (4):711-737. ISSN: 0706-652X. Four years following the *Exxon Valdez* oil spill, harvesting of the Pacific herring in the Prince William Sound area collapsed. Results from this study conclude that the *Exxon Valdez* oil spill did not contribute to the 1993 decline of the harvesting of the herring. However, poor nutritional status, either alone or in combination with disease or other natural factors, was most likely responsible for the 1993 collapse.
- Pelletier, M. C., et al. **Phototoxicity of individual polycyclic aromatic hydrocarbons and petroleum to marine invertebrate larvae and juveniles.** *Environmental Toxicology and Chemistry*. October 1997; 16 (10):2190-2199. ISSN: 0730-7268.
- Penry, D. L.; Weston, D. P. **Digestive determinants of benzo[alpha]pyrene and phenanthrene bioaccumulation by a deposit-feeding polychaete.** *Environmental Toxicology and Chemistry*. November 1998; 17 (11):2254-2265. ISSN: 0730-7268. *Abarenicola pacifica* were acclimated to sediments with low or high organic carbon and then transferred to respective low or high organic carbon test sediments contaminated with radiolabeled phenanthrene or benzo[a]pyrene. Physiological acclimation to the various sediment types did not affect PAH uptake, but it did affect biotransformation capabilities.
- Pezeshki, S. R.; Jugsujinda, A.; Delaune, R. D. **Responses of selected US Gulf coast marsh macrophyte species to oiling and commercial cleaners.** *Water Air and Soil Pollution*. October 1998; 107 (1/4):185-195. ISSN: 0049-6979. Bulltongue (*Sagittaria lancifolia* L.), three-cornered grass (*Scirpus olneyi* E. & G.) and broadleaf cattail (*Typha latifolia* L.) were tested using combinations of oil treatments and cleaning treatments. Bulltongue proved to be the least sensitive to the treatments, and the cattail was the most sensitive species tested.
- Piehler, M. F.; Swistak, J. G.; Pinckney, J. L.; Pearl, H. W. **Sub-lethal effects of coastal petroleum pollution on *Spartina alterniflora* stem epiphytes.** *Chemosphere*. December 1997; 35 (11):2665-2674. ISSN: 0045-6535.

- Ploch, S. A.; King, L. C.; DiGiulio, R. T. **Comparative time-course of benzo[a]pyrene-DNA adduct formation, and its relationship to CYP1A activity in two species of catfish.** *Marine Environment Research*. July-December 1998; 46 (1/5):345-349. ISSN: 0141-1136.
The brown bullhead (*Ameiurus nebulosis*) and the channel catfish (*Ictalurus punctatus*) have liver enzymes that activate or detoxify certain procarcinogens differently. EROD activity and adducts were studied in these fish. EROD activities in the channel catfish was predominantly higher than in the bullheads, but adducts were significantly higher in the bullheads than in the channel catfish.
- Poulton, B. C.; Finger, S. E.; Humphrey, S. A. **Effects of a crude oil spill on the benthic invertebrate community in the Gasconade River, Missouri.** *Archives of Environmental Contamination and Toxicology*. October 1997; 33 (3):268-276. ISSN: 0090-4341.
Macroinvertebrate communities in riffle and backwater habitats above and below the 3.3 million L spill in the Gasconade River were examined. In riffle habitats, oil pollution concentrations decreased significantly, and macroinvertebrate communities recovered rapidly, within 6 months of the spill. Backwater habitat recovery did not progress much at all during the 6 months.
- Poulton, B. C.; Callahan, E. V.; Hurtubise, R. D.; Mueller, B.G. **Effects of an oil spill on leafpack-inhabiting macroinvertebrates in the Chariton River, Missouri.** *Environmental Pollution*. 1998; 99 (1):115-122. ISSN: 0269-7491.
The stonefly (*Isoperla bilineata*), the caddisfly (*Potamyia flava*), the midge (*Thienemanniella xena*), and blackfly larvae (*Simulium sp.*) were virtually non-existent in test areas downstream of an oil spill. Sampling also showed that the community had recovered well within one year after the spill.
- Powell, Eric N., et al. **Influence of parasitism in controlling the health, reproduction and PAH body burden of petroleum seep mussels.** *Deep-Sea Research I*. 1999; 46 (12):2053-2078. ISSN: 0967-0637.
Petroleum seep mussels are continuously exposed to relatively high hydrocarbon concentrations in their natural habitat. This study provides an opportunity to document parasite body burdens in petroleum seep mussels, determine whether parasite body burdens vary spatially between nearby populations and between populations separated on larger scales, and evaluate the degree to which parasites might impact populations dynamics.
- Premila, V. E.; Rao, M. U. **Effect of crude oil on the growth and reproduction of some benthic marine algae of Visakhapatnam coastline.** *Oceanographic Literature Review*. 1998; 45 (3):542. ISSN: 0967-0653.
Fourteen species of marine algae were tested to determine the impact of crude oil on their growth, survival and reproductive potential. Although the tolerance levels of the different algae varied, growth was inhibited in all species exposed to the oil.
- Prichard, A. K.; Roby, D. D.; Bowyer, R. T.; Duffy, L. K. **Pigeon guillemots as a sentinel species: A dose-response experiment with weathered oil in the field.** *Chemosphere*. October 1997; 35 (7):1531-1548. ISSN: 0045-6535.
- Proffitt, C. Edward; Devlin, Donna J. **Are there cumulative effects in red mangroves from oil spills during seeding and sapling stages?** *Ecological Applications*. February 1998; 8 (1):121-127. ISSN: 1051-0761.
Red mangrove seedling propagules and saplings were subjected to oilings of No. 6 fuel oil and South Louisiana crude oil. According to these experiments, there was no evidence of cumulative effects of two oiling episodes on these plants.
- Reish, D. J.; Oshida, P. S.; Mearns, A. J.; Ginn, T. C.; Buchman, M. **Effects of pollution on marine organisms.** *Water Environment Research*. 1999; 71 (5):1100-1115. ISSN: 1061-4303.
This article is an overview of the ninth international symposium of responses of marine organisms to pollutants. Papers and abstracts reflect 10 different topics, which some describe reproductive toxicity and development, cellular culture and pathology, field studies and monitoring, and impacts of pollution on marine biotic communities. All topics are discussed in detail.
- Ren, H. F.; Hayashi, T. **Mutagenicity in several fishes caught in a sea area polluted by C heavy oil spilled from the Nakhodka.** *Journal of the Food Hygienic Society of Japan*. 1999; 40 (3):230-232. ISSN: 0015-6426.

Safonova, E. T.; Dmitrieva, I. A.; Kvitko, K. V. **The interaction of algae with alcanotrophic bacteria in black oil decomposition.** *Resources, Conservation and Recycling*. 1999; 27 (1/2):193-201. ISSN: 0921-3449.

Algal strains, belonging to three algal classes, originating from soils and water bodies contaminated with oil and tolerant against elevated amounts of toxicants, were tested for the ability to grow in a mineral medium containing 1% of black oil. The presence of alcanotrophic bacteria was found to restore the reproduction in algae sensitive to black oil, and to stimulate cell growth in tolerant algal strains. The interaction of algae with alcanotrophic bacteria demonstrated maximum efficiency for the bioremediation of black oil, more so than pure culture alcanotrophic bacteria *Rhodococcus sp.*

Sanchezhernandez, J.C., et al. **Use of biochemical biomarkers as a screening tool to focus the chemical monitoring of organic pollutants in the Biobio river basin (Chile).** *Chemosphere*. August 1998; 37 (4):699-710. ISSN: 0045-6535.

The study showed that examining certain biochemical functions of biomarkers such as rainbow trout was a sensitive indicator of PAH contamination than simply monitoring chemicals in the water and soil.

Satoh, H.; Tshuchiya, K.; Tsujimoto, R. **Long-term effect of massive crude oil spill during the Gulf War on intertidal invertebrates.** *Mer*. 1999; 37 (1):11-19. During the Gulf War of 1991, a massive oil spill covered the shoreline from the southern area of Kuwait to the west side of the Abu Ali Island in the western Arabian Gulf. A large amount of oil is still left along the intertidal level of these beaches. During the period from February 1992 to November 1994, surveys were conducted and sediment samples of oil sites were collected from the Gulf Coast. Analyses are presented in three phases of the research.

Shelton, M. E.; Chapman, P. J.; Foss, S. S.; Fisher, W. S. **Degradation of weathered oil by mixed marine bacteria and the toxicity of accumulated water-soluble material to two marine crustacea.** *Archives of Environmental Contamination and Toxicology*. January 1999; 36 (1):13-20. ISSN: 0090-4341. Four diverse cultures of mixed marine bacteria were used to degrade weathered crude oil, producing both neutral and acidic water-soluble fractions. Grass shrimp (*Palaemonetes pugio*) and mysid larvae (*Mysidopsis bahia*) were exposed to the neutral water-soluble fractions from each of the cultures, which resulted in high mortality rates.

Shore, Richard, F.; Wright, Julian; Horne, Janice A.; Sparks, Timothy H. **Polycyclic aromatic hydrocarbon (PAH) residues in the eggs of coastal-nesting birds from Britain.** *Marine Pollution Bulletin*. 1999; 38 (6):509-513. ISSN: 0025-326X.

Accumulation of background environmental levels of PAHs in eggs by coastal nesting birds in at least two areas of Britain is common but is unlikely to be sufficient to cause embryotoxic effects. However, it is possible that individuals nesting in more polluted areas and species which feed predominantly on prey that accumulate high PAH residues, may have higher levels of PAH contamination in eggs. Further studies of the spatial, temporal and species-based variations in 'background' PAH concentrations in seabird eggs and of the embryotoxicity of both single PAHs and mixtures are required to determine the potential effects of PAHs on reproductive success in coastal-nesting species.

Singer, M. M.; George, S.; Lee, I., et al. **Effects of dispersant treatment on the acute aquatic toxicity of petroleum hydrocarbons.** *Archives of Environmental Contamination and Toxicology*. 1998; 34 (2):177-187. ISSN: 0090-4341.

Three marine species were used to test the effects of untreated and dispersant-treated Prudhoe Bay crude oil. The untreated oil had greater initial effects on the mysids and topmelt, whereas more abalone larval abnormalities and mysid mortality were exhibited with the treatment of dispersed oil.

Smith, S. D. A.; Simpson, R. D. **Recovery of benthic communities at Macquarie Island (sub-Antarctic) following a small oil spill.** *Marine Biology*. June 1998; 131 (3):567-581. ISSN: 0025-3162.

Seven years following an oil spill from the *Nella Dan*, intertidal communities in three zones of the rocky shore were sampled. Samples of *durvillaea antarctica* found in heavily oiled areas showed moderate levels of recovery; however, samples from moderately oiled areas showed little signs of recovery.

Stagg, R. M.; Robinson, C.; McIntosh, A. M.; Moffat, C. F.; Bruno, D.W. **The effects of the 'Braer' oil spill, Shetland Isles, Scotland, on P4501A in farmed Atlantic salmon (*Salmo salar*) and the common dab (*Limanda limanda*).** *Marine Environmental Research*. July-December 1998; 46 (1/5):301-306. ISSN: 0141-1136.

The Atlantic salmon and the common dab were examined primarily to measure the induction of detoxification enzymes and to study the relationship of these enzymes to concentrations and distributions of aromatic hydrocarbons measured in sediment, water and the fish. Over longer periods of time, the hepatic pathology of the dab was predictive of neoplasia.

- Steinert, S. A.; Streib Montee, R.; Sastre, M. P. **Influence of sunlight on DNA damage in mussels exposed to polycyclic aromatic hydrocarbons.** *Marine Environmental Research*. July-December 1998; 46 (1/5):355-358. ISSN: 0141-1136.
Mussels were deployed in a control and a PAH-contaminated site in San Diego Bay to study DNA damage in contaminated mussels exposed to sunlight. The exposed mussels showed significant DNA damage under sunlight and ultraviolet light conditions.
- Stephenson, R. **Effects of oil and other surface-active organic pollutants on aquatic birds.** *Environmental Conservation*. June 1997; 24 (2):121-129. ISSN: 0376-8929.
The research concluded that even a small amount of organic material could affect the surface tension of water enough to cause feather wetting in water fowl.
- Stewart, R. S.; Emmons, C.; Porfirio, D.; Wiggers, R. J. **Distribution of multiple oil tolerant and oil degrading bacteria around a site of natural crude oil seepage.** *Texas Journal of Science*. November 1997; 49 (4):339-344. ISSN: 0040-4403.
The community of petroleum utilizing bacteria exhibited much composition variation over small geographic distances.
- Stoskopf, M. K., et al. **The impact of water temperature on core body temperature of North American river otters (*Lutra canadensis*) during simulated oil spill recovery washing protocols.** *Journal of Zoo and Wildlife Medicine*. December 1997; 28 (4):407-412. ISSN: 1042-7260.
Core body temperatures of otters washed in water colder than body temperature dropped at a rate of 0.1°C/min. Core body temperatures of otters washed in body temperature water did not drop until after the washing process was complete, at which time they began dropping at a rate of 0.1°C/min. Within three hours the otters' temperatures had returned to normal.
- Street, G. T.; Lotufo, G. R.; Montagna, P. A.; Fleeger, J. W. **Reduced genetic diversity in a meiobenthic copepod exposed to a xenobiotic.** *Journal of Experimental Marine Biology and Ecology*. April 1, 1998; 222 (1/2):93-111. ISSN: 0022-0981.
Two species of copepods were exposed to PAHs, to determine adult survival and offspring survival rates. Results show that the adults as well as the larvae experienced low survival rates.
- Sundt, H.; Goksøyr, A. **In vivo and in vitro biotransformation of polycyclic aromatic hydrocarbons in the edible crab, *Cancer pagurus*.** *Marine Environmental Research*. July-December 1998; 46 (1/5):515-519. ISSN: 0141-1136.
Direct fluorimetry of hepatopancreas cytosol was used to analyze the metabolism of benzo[a]pyrene, and a pyrene hydroxylase assay was developed.
- Suprayogi, B.; Murray, F. **A field experiment of the physical and chemical effects of two oils on mangroves.** *Environmental and Experimental Botany*. 1999; 42 (3):221-229. ISSN: 0098-8472.
- Tkalec, M.; Vidakovicifrek, Z.; Regula, I. **The effect of oil industry "high density brines" on duckweed *Lemna minor* L.** *Chemosphere*. December 1998; 37 (13):2703-2715. ISSN: 0045-6535.
- Toril, I.; Roe, U.; Johnsen, S. **Bioavailability of polycyclic aromatic hydrocarbons in the North Sea.** *Environmental Science & Technology*. 1999; 33 (12):1963-1969. ISSN: 0013-936X.
This research was conducted to determine the bioavailable fraction of polycyclic aromatic hydrocarbons (PAHs) from oil field produced water in the North Sea using seimpermeable membrane devices (SPMDs) and the blue mussel (*Mytilus edulis*) as markers.
- Trust, Kimberly A.; Esler, D.; Woodin, B. R.; Stegeman, J. J. **Cytochrome P450 1A induction in sea ducks inhabiting nearshore areas of Prince William Sound, Alaska.** *Marine Pollution Bulletin*. 2000; 40 (5):397-403. ISSN: 0025-326X.
The presence of P450 1A in harlequin ducks and Barrow's goldeneyes was discovered leading investigators to conclude that these aquatic species are possibly being exposed to residual oil from the spill of the *Exxon Valdez*.
- Uysal, Z.; Saydam, C.; Yilmaz, K. **Impact of the recent oil spill (*Nassia*) in bosphorus (Turkey) on developmental stages of sea urchin (*Paracentrotus lividus* Lam.) eggs.** *Fresenius Environmental Bulletin*. September-October 1997; 6 (9/10):584-588. ISSN: 1018-4619.

- van den Heuvel, M. R. ; et al. **Effects of oil sands related aquatic reclamation on yellow perch (*Perca flavescens*). I. Water quality characteristics and yellow perch physiological and population responses.** *Canadian Journal of Fisheries and Aquatic Sciences*. 1999; 56 (7):1213-1225. ISSN: 0706-652X.
Exposure of yellow perch to waters associated with oil sands reclamation does not compromise the short-term physiological status of exposed individuals. Physiological indices in early life development of the yellow perch are more sensitive than adult fish, and therefore would be the best tool for predicting potential risks to the population.
- van Den Hurk, P.; Faisal, M.; Roberts, M. H., Jr. **Interaction of cadmium and benzo[a]pyrene in mummichog (*Fundulus heteroclitus*): effects on acute mortality.** *Marine Environmental Research*. July-December 1998; 46 (1/5):525-528. ISSN: 0141-1136.
The effects of single and combined exposure of cadmium and benzo[a]pyrene on acute mortality of mummichogs were studied. The results indicated both synergistic and antagonistic effects can occur because of exposure to these contaminants.
- van Den Hurk, P.; Roberts, M. H., Jr.; Faisal, M. **Interaction of cadmium and benzo[a]pyrene in mummichog (*Fundulus heteroclitus*): biotransformation in isolated hepatocytes.** *Marine Environmental Research*. July-December 1998; 46 (1/5):529-532. ISSN: 0141-1136.
The study showed that cadmium does not influence the profile of generated benzo[a]pyrene metabolites, but the initial rate of benzo[a]pyrene breakdown is decreased by exposure to cadmium.
- van Tamelen, P. G.; Stekoll, M. S.; Deysher, L. **Recovery processes of the brown alga (*Fucus gardneri*) following the 'Exxon Valdez' oil spill: settlement and recruitment.** *Marine Ecology Progress Series*. 1997; 160:265-277. ISSN: 0171-8630.
After three years, zygote settlement rates in oiled settings were comparable to those in unoiled settings, except in the upper intertidal zone. It was found that a grooved bottom surface enhanced survival and recruitment of germlings in the high intertidal zone.
- Vazquez, M. A.; Allen, K. W.; Kattan, Y. M. **Long-term effects of the 1991 Gulf War on the hydrocarbon levels in clams at selected areas of the Saudi Arabian Gulf coastline.** *Marine Pollution Bulletin*. 2000; 40 (5):440-448. ISSN: 0025-326X.
Researchers investigated the presence of hydrocarbons in the clam *Meretrix meretrix* at both pre- and post-war periods. There was no significant increase in n-alkane levels in the study groups. There were significant increases in dibenzothiophenes and phenanthrenes brought about during the war, although after 2 years the amounts returned to pre-war levels.
- Voparil, I. M.; Mayer, L. M. **Dissolution of sedimentary polycyclic aromatic hydrocarbons into the lugworm's (*Arenicola marina*) digestive fluids.** *Environmental Science & Technology*. 2000; 34 (7):1221-1228. ISSN: 0013-936X.
Mechanisms of PAH solubilization by the lugworm were investigated, as were implications of these processes for controlling PAH bioavailability. Possible reasons for these processes are discussed.
- Walton, P., et al. **Sub-lethal effects of an oil pollution incident on breeding kittiwakes *Rissa tridactyla*.** *Marine Ecology Progress Series*. 1997; 155:261-268. ISSN: 0171-8630.
Breeding kittiwakes were collected and observed in 1993, just after the *Braer* oil tanker wreck in Shetland, Scotland. Characteristics of these birds were compared with results of the breeding populations from previous years. High levels of anemia, low return rates and low mate fidelity were observed in the year of the spill.
- Wang, J. S.; Chou, H. N.; Fan, J. J.; Chen, C. M. **Uptake and transfer of high PCB concentrations from phytoplankton to aquatic biota.** *Chemosphere*. March 1998; 36 (6):1201-1210. ISSN: 0045-6535.
- Webster, L., et al. **Long-term monitoring of polycyclic aromatic hydrocarbons in mussels (*Mytilus edulis*) following the *Braer* oil spill.** *Analyst*. December 1997; 122 (12):1491-1495. ISSN: 0003-2654.
In 1995, mussels were transplanted into a fisheries exclusion zone and tested through 1996 for PAHs. PAH concentrations fluctuated seasonally, increasing in the winter months.

- Weston, D. P.; Mayer, L. M. **In vitro digestive fluid extraction as a measure of the bioavailability of sediment-associated polycyclic aromatic hydrocarbons: sources of variation and implications for partitioning models.** *Environment Toxicology and Chemistry*. May 1998; 17 (5):820-829. ISSN: 0730-7268.
Sediment PAH solubilization by polychaete and echinuran digestive fluid correlated highly and appeared to be because of surfactant properties of the fluids. An increased potential for bioaccumulation or toxicity results from digestive fluid containing PAHs remaining in the gut through sequential digestion of many gut volumes.
- Weston, D. P.; Mayer, L. M. **Comparison of in vitro digestive fluid extraction and traditional in vivo approaches as measures of polycyclic aromatic hydrocarbon bioavailability from sediments.** *Environmental Toxicology and Chemistry*. May 1998; 17 (5):830-840. ISSN: 0730-7268.
The effect of polychaete selective feeding was minimal, increasing the PAH content of ingested material.
- White, P. A.; Rasmussen, J. B.; Blaise, C. **Genotoxic substances in the St. Lawrence system II: Extracts of fish and macroinvertebrates from the St. Lawrence and Saguenay Rivers, Canada.** *Environmental Toxicology and Chemistry*. February 1998; 17 (2):304-316. ISSN: 0730-7268.
- Wilkinson, C. R. **Global and local threats to coral reef functioning and existence: review and predictions.** *Marine and Freshwater Research*. 1999; 50 (8):867-878. ISSN: 1323-1650.
Factors causing global degradation of coral reefs are examined briefly as a basis for predicting the likely consequences of increases in these factors. This article looks at various disruptions of coral reefs, and shows how coral reefs have remarkable resilience to severe disruption. Prognosis is discussed.
- Wiltse, C. C., et al. **Greenhouse evaluation of agronomic and crude oil phytoremediation potential among alfalfa genotypes.** *Journal of Environmental Quality*. January-February 1998; 27 (1):169-173. ISSN: 0047-2425.
Only two genotypes of alfalfa exhibited much higher degradation rates than the degradation rates of the unplanted contaminated soil. Plants grown in contaminated soil exhibit much lower yields and were more stunted than plants grown in uncontaminated soil.
- Wolfe, M. F., et al. **Influence of dispersants on trophic transfer of petroleum hydrocarbons in a marine food chain.** *Spill Science & Technology Bulletin*. 1996; 3 (4):255-258. ISSN: 1353-2561.
Naphthalene uptake increased in both algae (*Isochrysis galbana*) and rotifers (*Brachionus plicatilis*) with the use of dispersants.
- Wolfe, M. F., et al **Effects of salinity and temperature on the bioavailability of dispersed petroleum hydrocarbons to the golden-brown algae, *Isochrysis galbana*.** *Archives of Environmental Contamination and Toxicology*. August 1998; 35 (2):268-273. ISSN: 0090-4341.
Algae was exposed to samples of Prudhoe Bay crude oil and Prudhoe Bay crude oil mixed with the dispersant Corexit 9527 spiked with [U-C-14]naphthalene. Under all conditions, the dispersant enhanced the uptake of naphthalene.
- Wolfe, M. F., et al **Influence of dispersants on the bioavailability of naphthalene from the water-accommodated fraction crude oil to the golden-brown algae, *Isochrysis galbana*.** *Archives of Environmental Contamination and Toxicology*. August 1998; 35 (2):274-280. ISSN: 0090-4341.
- Wolkers, J.; Jørgensen, E. H.; Nijmeijer, S. M.; Witkamp, R. F. **Dose and time dependency of cytochrome P4501A induction in liver and kidney of B[a]P exposed Arctic Charr (*Salvelinus alpinus*).** *Marine Environmental Research*. 1998; 46 (1/5):117-120. ISSN: 0141-1136.
Although no clear dose-response could be observed in the liver and kidneys of immature Arctic charr exposed to benzo[a]pyrene, the apparent sensitivity of both organs to the pollutant can be considered advantageous for biomonitoring.
- Wu, R. S. S.; Lam, P. K. S.; Zhou, B. S. **Effects of two oil dispersants on phototaxis and swimming behaviour of barnacle larvae.** *Oceanographic Literature Review*. June 1998; 45 (6):1032. ISSN: 0967-0653.
Increased concentrations of dispersant diesel mixtures caused a significant change in the curvilinear (VCL) and straight-line (VSL) velocities of the larvae.
- Yang, C. Y.; et al. **Female lung cancer mortality and sex ratios at birth near a petroleum refinery plant.** *Environmental Research*. 2000; 83 (1):33-40. ISSN: 0013-9351.
In communities adjacent to a petroleum refinery, female lung cancer rates rose over a period covering 3 decades. However, the study did not find a significant association between air pollution from the plant and abnormal sex ratios at birth.

Abu-Eishah, S. I. **A new correlation for prediction of the kinematic viscosity of crude oil fractions as a function of temperature, API gravity, and 50% boiling-point temperature.** *International Journal of Thermophysics*. 1999; 20 (5):1425-1434. ISSN: 0195-928X.

The viscosity behavior of crude oils is qualitatively similar to that of pure liquids. Oils are known to become less viscous as temperature increases, but no theory has yet been formulated to predict precisely the variation in viscosity of liquids with temperature. This article provides experimental data for a wide range of temperatures that were used with a new kinematic viscosity-temperature correlation for liquid petroleum fractions.

Adam, P.; Philippe, E.; Albrecht, P. **Photochemical sulfurization of sedimentary organic matter: A widespread process occurring at early diagenesis in natural environments?** *Geochimica et Cosmochimica Acta*. January 1998; 62 (2):265-271. ISSN: 0016-7037.

Efficient sulphurization of organic matter under sunlight conditions to form organo-sulfur compounds was achieved. The results indicate that sulfurization of organic matter can occur in areas of low or no oxygen with light.

Adoki, A.; Sokari, T. G.; Ibiebele, D. D. **Effects of amendments on biodegradation of crude petroleum by sediment bacteria from Bonny River Estuary.** *African Journal of Ecology*. 1999; 37 (3):258-266. ISSN: 0141-6707.

Biodegradation by aquatic microorganisms can play an important role in the fate of organic pollutants. The use of bacteria in batch culture was enhanced by the addition to culture media, of 0.2 mg of urea and soya bean lecithin per 100 ml of crude oil, sediment and water mixture. There was a direct relationship between hydrocarbon content and the proportion (%) of total heterotrophs that was capable of growing on crude petroleum as a sole carbon and energy source.

Ahmed, O.T.; Mostafa, G.A.; Al-Rasbi, S.A.; Askar, A.A. **Capillary gas chromatography determination of aliphatic hydrocarbons in fish and water from Oman.** *Chemosphere*. March 1998; 36 (6):1391-1403. ISSN: 0045-6535.

Akhlaq, M.S. **Polycyclic aromatic hydrocarbons in crude oil-contaminated soil: a two-step method for the isolation and characterization of PAHs.** *Environmental Science and Pollution Research*. 1997; 4 (4):217-222. ISSN: 0944-1344.

Aldrett, S., et al. **Microbial degradation of crude oil in marine environments tested in a flask experiment.** *Water Research*. November 1997; 31 (11):2840-2848. ISSN: 0043-1354.

Twelve bioaugmenting agents and 1 biostimulating agent, all from the NCP product schedule, were analyzed over a 28-day period for most probably number (MPN) of hydrocarbon degraders and total petroleum hydrocarbons.

Alleman, Bruce C.; Leeson, Andrea. *In Situ and On-Site Bioremediation: Volume 1*. Columbus, OH: Battelle Press; 1997; 590 pgs.; ISBN: 1-57477-026-8. Volume 1 includes articles on the natural attenuation and biodegradation of petroleum hydrocarbons.

Alleman, Bruce C.; Leeson, Andre. *In Situ and On-Site Bioremediation: Volume 4*. Columbus, OH: Battelle Press; 1997; 658 pgs. ISBN: 1-57477-029-2. Collected articles in this volume examine the use of microbial, physical, and chemical processes to support and enhance *in situ* bioremediation. Several articles focus on toxicity and geochemical considerations and the particular challenges presented by crude oil bioremediation in marine environments.

Alleman, Bruce C.; Leeson, Andre. *In Situ Bioremediation of Petroleum Hydrocarbon and Other Organic Compounds*. Columbus, OH: Battelle Press; 1999; 588 pgs. ISBN: 1-57477-076-4. This volume provides a comprehensive guide to the latest technological breakthroughs in both the laboratory and the field for accelerated bioremediation and other topics.

Al-Lihaibi, S.S.; Ghazi, S.J. **Hydrocarbon distributions in sediments of the open area of the Arabian Gulf following the 1991 Gulf War oil spill.** *Marine Pollution Bulletin*. November 1997; 34 (11):941-948. ISSN: 0025-326X.

Oil in the study area was relatively low. The average oil concentration in the sediment was 32.6 µg/g. Surface oil concentrations tended toward the northeast, and among individual transects the trend was toward the northwest.

Al-Omran, L. A.; Rao, C. V. N. **The distribution and sources of hydrocarbons in the regional sea area of the Arabian Gulf.** *Kuwait Journal of Science & Engineering*. 1999; 26 (2):301-314. ISSN: 1024-8684.

Al-Sabagh, A. M.; Atta, A. M. **Water-based non-ionic polymeric surfactants as oil spill dispersants.** *Journal of Chemical Technology and Biotechnology.* 1999; 74 (11):1075-1081. ISSN: 0268-2575.

The use of chemical dispersants as a countermeasure to oil spills at sea is an accepted technique worldwide. This paper describes an experiment that uses polymeric surfactants and water-based dispersants to increase microbial populations and to accelerate the biological degradation of the spilled oil.

Anaerobic biodegradation of long-chain n-alkanes under sulfate-reducing conditions. *Environmental Science & Technology.* July 15, 1998; 32 (14):2191-2195. ISSN: 0013-936X. GC analysis showed nearly

complete n-alkane removal from weathered oil within 201 days when sulfate reduction was the primary electron-accepting process. Extensive alteration in the n-alkanes can no longer be considered a defining characteristic of aerobic oil biodegradation only.

Anderson, R. T.; Lovley, D. R. **Anaerobic bioremediation of benzene under sulfate-reducing conditions in a petroleum-contaminated aquifer.** *Environmental Science & Technology.* 2000; 34 (11):2261-2266. ISSN: 0013-936X.

Sulfate-reducing microorganisms were added to a petroleum contaminated anaerobic aquifer in which benzene was the major soluble contaminant. Ten weeks prior to the injection of sulfate reducers, treatment zones were sampled to determine baseline concentrations of benzene, sulfate, bromide, and dissolved Fe (II). This field study suggests that the addition of sulfate stimulated the activity of benzene-degrading, sulfate-reducing microorganisms.

Andrusevich, V. E.; Engel, M. H.; Zumberge, J. E.; Brothers, L.A. **Secular, episodic changes in stable carbon isotope composition of crude oils.** *Chemical Geology.* October 26, 1998; 152 (1/2):59-72. ISSN: 0009-2541.

The diversity of preserved phytoplankton is believed to be the cause of isotopic shifts in the crude oil samples.

April, T. M.; Abbott, S. P.; Foght, J. M.; Currah, R. S. **Degradation of hydrocarbons in crude oil by the ascomycete, *Pseudallescheria boydii* (Microascaceae).** *Canadian Journal of Microbiology.* March 1998; 44 (3):270-278. ISSN: 0008-4166.

Four strains of *Pseudallescheria boydii* were isolated from oil-contaminated soils and compared to strains from sewage. Three of the strains from the contaminated soil degraded the linear aliphatics in Prudhoe Bay Crude oil.

Barba, M. T., et al. **Bioremediation of oil-contaminated desert soil: The Kuwaiti experience.** *Environment International.* January-February 1998; 24 (1/2):163-173. ISSN: 0160-4120.

Barakat, A. O.; Mostafa, A.; Elgayar, M. S.; Rullkotter, J. **Source-dependent biomarker properties of five crude oils from the Gulf of Suez, Egypt.** *Organic Geochemistry.* April-May 1997; 26 (7/8):441-450. ISSN: 0146-6380.

Five crude oils from producing wells in the southern Gulf of Suez where characterized using a variety of organic geochemical parameters. The geochemical characteristics of the oils varied sufficiently to suggest multiple sources. The oils consisted of two oil types and one mixed type.

Barakat, A. O.; Mostafa, A. R.; Rullkotter, J.; Hegazi, A. R. **Application of a multimolecular marker approach to fingerprint petroleum pollution in the marine environment.** *Marine Pollution Bulletin.* 1999; 38 (7):535-544. ISSN: 0025-326X.

Gas chromatography and gas chromatography/mass spectrometry methods were used to determine the origin of pollution and molecular composition of tar ball samples collected from the beaches of a small island impacted by heavy tar loads.

Batterby, N. S.; et al. **An 'inherent' biodegradability test for oil products: description and results of an international ring test.** *Chemosphere.* 1999; 38 (14):3219-3235. ISSN: 0045-6535.

A European task force has developed a standard protocol test for assessing the 'inherent' biodegradability of oil. It was designed for water-soluble organic compounds of low volatility and is unsuitable for most oil products.

Battersby, N. S. **The biodegradability and microbial toxicity testing of lubricants - some recommendations.** *Chemosphere.* 2000; 41 (7):1011-1027. ISSN: 0045-6535.

This paper presents methods of determining the biodegradability of lubricants under a variety of environmental conditions, and methods of generating information and data interpretation from various tests of lubricants.

Beens, J.; Brinkman, U. **The role of gas chromatography in compositional analyses in the petroleum industry.** *TRAC - Trends in Analytical Chemistry.* 2000; 19 (4):260-275. ISSN: 0165-9936.

- Bennett, Philip C.; Hiebert, Franz K.; Rogers, Jennifer Roberts. **Microbial control of mineral-groundwater equilibria: Macroscale to microscale.** *Hydrogeology Journal*. 2000; 8;47-62. ISSN: 1431-2174.
A petroleum-contaminated aquifer in Minnesota was investigated to determine the effects on groundwater chemistry and possible trace nutrient release from organisms.
- Bettahar, M.; Schafer, G.; Baviere, M. **An optimized surfactant formulation for the remediation of diesel oil polluted sandy aquifers.** *Environmental Science & Technology*. 1999; 33 (8):1269-1272. ISSN: 0013-936X.
Using alcohol with a mixture of two surfactants contributes to improving both is injectability and the efficiency of the recovery of entrapped diesel oil.
- Black, K. S.; Paterson, D. M.; Davidson, I. R. **Sediment microfabric of oil rig drill spoil heaps: preliminary observations using low-temperature scanning electron microscopy.** *Environmental Science & Technology*. 1999; 33 (12):1983-1990. ISSN: 0013-936X.
This paper presents the first microfabric analyses of submerged spoil sediments using low-temperature scanning electron micrographs (LTSEM), and confirms the potential of this technique in terms of environmental assessment and analysis of the nature of sediment fabric of oily, drill spoil heaps.
- Boehm, P. D., et al. **Application of petroleum hydrocarbon chemical fingerprinting and allocation techniques after the Exxon Valdez oil spill.** *Marine Pollution Bulletin*. August 1997; 34 (8):599-613. ISSN: 0025-326X.
Petroleum chemical fingerprinting techniques are discussed; along with how these techniques were used to characterize and differentiate between petroleum sources in the Prince William Sound region after the Exxon Valdez spill.
- Boehm, P. D., et al. **Study of the fates and effects of the Exxon Valdez oil spill on benthic sediments in two bays in Prince William Sound, Alaska. 1. Study design, chemistry, and source fingerprinting.** *Environmental Science and Technology*. 1998; 32 (5):567-576. ISSN: 0013-936X.
A stratified random-sampling was conducted in an oiled bay, and a bay that received little impact from the Exxon Valdez spill. Assessments of subtidal and sediment chemistry results were analyzed.
- Bolliger, C.; Hohener, P.; Hunkeler, D.; Haberli, K.; Zeyer, J. **Intrinsic bioremediation of a petroleum hydrocarbon-contaminated aquifer and assessment of mineralization based on stable carbon isotopes.** *Biodegradation*. 1999; 10 (3):201-217. ISSN: 0923-9820.
- Boufadel, M. C.; et al. **Optimal nitrate concentration for ht biodegradation of n-heptadecane in a variably-saturated sand column.** *Environmental Technology*. 1999; 20 (2):191-199. ISSN: 0959-3330.
- Brown, J. L., et al. **On-site treatment of contaminated soils: An approach to bioremediation of weathered petroleum compounds.** *Journal of Soil Contamination*. 1998; 7 (6):773-800. ISSN: 1058-8337.
- Bruheim, P.; Eimhjellen, K. **Chemically emulsified crude oil as substrate for bacterial oxidation: differences in species response.** *Canadian Journal of Microbiology*. February 1998; 44 (2):195-199. ISSN: 0008-4166.
Four bacterial species were tested on oxidation of alkanes in emulsified water and crude oil. The surfactants affected the various bacteria differently, and the bacteria responded differently to the surfactant according to which growth phase the bacteria were in. Both negative and positive effects of surfactant amendment were observed.
- Budzinski, H., et al. **Aerobic biodegradation of alkylated aromatic hydrocarbons by a bacterial community.** *Organic Geochemistry*. 1998; 28 (5):337-348. ISSN: 0146-6380.
Arabian light crude oil residue was used to prepare the aromatic fraction and was incubated with the bacteria under oxic conditions for up to seven days. The aromatic compounds were the bacteria's sole source of carbon, with no preference between non-sulphur and sulphur aromatic compounds.
- Burns, K. A.; Codi, S.; Swannell, R. J. P.; Duke, N. C. **Assessing the oil degradation potential of endogenous micro-organisms in tropical marine wetlands.** *Mangroves and Salt Marshes*. 1999; 3 (2):67-83.
A series of flask experiments were conducted to test for the presence of hydrocarbon degrading microorganisms in representative wetland habitats in Australia. Also tested was the biodegradation of selected oils that are transported along the Australian coast. Comparison of the efficiency of inoculates from three tropical intertidal habitats indicated the presence of hydrocarbon degrading microorganisms in all three habitats. These results were used to formulate a bioremediation strategy to treat oiled sediments in mangrove forests in Queensland, Australia, which was based on forced aeration and nutrient addition.
- Caldwell, M. E.; Tanner, R. S.; Sufliata, J. M. **Microbial metabolism of benzene and the oxidation of ferrous iron under anaerobic conditions: Implications for bioremediation.** *Anaerobe*. 1999; 5 (6):595-603. ISSN: 1075-9964.

- Cerniglia, C. E. **Fungal metabolism of polycyclic aromatic hydrocarbons: past, present and future applications in bioremediation.** *Journal of Industrial Microbiology & Biotechnology*. November-December 1997; 19 (5/6):324-333. ISSN: 0169-4146.
- Chang, W. K.; Criddle, C. S. **Experimental evaluation of a model for cometabolism: prediction of simultaneous degradation of trichloroethylene and methane by a methanotrophic mixed culture.** *Biotechnology and Bioengineering*. December 5, 1997; 56 (5):492-501. ISSN: 0006-3592.
The model successfully predicted TCE transformation and methane utilization for a wide range of TCE and methane concentrations.
- Cho, B. H., et al. **Laboratory-scale bioremediation of oil-contaminated soil of Kuwait with soil amendment materials.** *Chemosphere*. October 1997; 35 (7):1599-1611. ISSN: 0045-6535.
- Cho, B. H., et al. **Analysis of oil components and hydrocarbon-utilizing microorganisms during laboratory-scale bioremediation of oil-contaminated soil of Kuwait.** *Chemosphere*. October 1997; 35 (7):1613-1621. ISSN: 0045-6535.
- Connell, D. W., et al. **Occurrence of persistent organic contaminants and related substances in Hong Kong marine areas: an overview.** *Marine Pollution Bulletin*. May 1998; 36 (5):376-384. ISSN: 0025-326X.
An examination of data collected 1987 and 1996 at 66 stations in and around Hong Kong indicated an overall decrease in PAH contamination, with the exception of samples taken from typhoon shelters, Victoria Harbor, and during the years of 1995-1996.
- Cornelissen, G., et al. **Two-stage desorption kinetics and *in situ* partitioning of hexachlorobenzene and dichlorobenzenes in a contaminated sediment.** *Chemosphere*. November 1997; 35 (10):2405-2416. ISSN: 0045-6535.
- Crunkilton, R. L.; Devita, W. M. **Determination of aqueous concentrations of polycyclic aromatic hydrocarbons (PAHs) in an urban stream.** *Chemosphere*. October 1997; 35 (7):1447-1463. ISSN: 0045-6535.
- Dachs, J.; Fernandez, I.; Bayona, J. M. **Combined experimental design and information theory for the optimization of supercritical fluid extraction of organic priority pollutants from sediment.** *Analytica Chimica Acta*. September 30, 1997; 351 (1/3):377-385. ISSN: 0003-2670.
- DeLaune, R. D.; Lindau, C. W.; Banker, B. C.; Devai, I. **Degradation of petroleum hydrocarbons in sediment receiving produced water discharge.** *Journal of Environmental Science and Health Part A - Toxicology Hazardous Substances and Environmental Engineering*. 2000; 35 (1):1-14. ISSN: 1093-4529.
Sediment samples were collected from a low energy brackish wetland site in South Louisiana, which had been exposed for a number of years of produced water discharge. These samples were placed in laboratory incubation and South Louisiana Crude oil was added to the sediments in order to determine the degradation rates of selected petroleum hydrocarbon components with time. Fertilizer and nutrient amendments were then added to the contaminated sediments in order to determine the degradation rates of n-alkanes in soluble molecular weight fractions and higher molecular weight fractions.
- Delaune, R. D.; Mulbah, C.; Devai, I.; Lindau, C. W. **Effect of chromium and lead on degradation of South Louisiana Crude oil in sediment.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 1998; 33 (4):527-546. ISSN: 1093-4529.
- Delille, D.; Delille, B. **Field observations on the variability of crude oil impact on indigenous hydrocarbon-degrading bacteria from sub-Antarctic intertidal sediments.** *Marine Environmental Research*. 2000; 49 (5):403-417. ISSN: 0141-1136.
The focus of this study was to assess microbial assemblages and the critical role they play in degrading hydrocarbons; and to understand the impact of petroleum pollutants on the metabolism and abundance of natural microbial communities.
- Delille, D.; Basseres, A.; Dessommes, A. **Effectiveness of bioremediation for oil-polluted Antarctic seawater.** *Polar Biology*. April 1998; 19 (4):237-241. ISSN: 0722-4060.
Coastal bacterioplanktonic communities were surveyed for 5-week periods after the addition of Arabian Light Crude oil. The addition of fertilizer clearly enhanced both saprophytic and hydrocarbon-utilizing microflora.
- Devai, I., et al. **Environmental significance of atmospheric emission resulting from *in situ* burning of oiled salt marsh.** *Marine Environmental Research*. March 1998; 45 (2):157-167. ISSN: 0141-1136.
Smoke plume samples contained gaseous sulfur and carbon compounds, with carbonyl sulfide and carbon disulfide being the main volatile sulfur compounds. Aromatic hydrocarbons found were mostly pyrogenic or combustion derived aromatic hydrocarbons.

- Douabul, A. A. Z.; Heba, H. M. A.; Fareed, K. H. **Polynuclear aromatic hydrocarbons (PAHs) in fish from the Red Sea Coast of Yemen.** *Hydrobiologia*. September 5, 1997; 352:251-262. ISSN: 0018-8158. HPLC, GC, and GC/MS were used to analyze PAHs in fish from the Red Sea. It was found that the most probable source of PAHs is oil contamination from spills and heavy ship traffic, but it was thought that the presence of PAHs in the fish muscles was not responsible for the reported fish kill.
- Downey, Douglas C.; Hinchey, Robert E.; Miller, Ross N. **Cost-Effective Remediation and Closure of Petroleum-Contaminated Sites.** Columbus, OH: Battelle Press; 1999; 320 pgs.; ISBN: 1-57477-071-3. This book provides environmental managers and their supporting technical specialists with a comprehensive strategy for cost-effective clean up methods of soils and groundwater contaminated by petroleum releases.
- Duncan, K. E., et al. **Microbial dynamics in oil-impacted prairie soil.** *Applied Biochemistry and Biotechnology*. 1999; 77(9):421-434. ISSN: 0273-2289. In 1992, a pipeline break contaminated a remote site in the Tallgrass Prairie preserve with crude oil. In 1996, bioremediation of the contaminated soil was enhanced by blending uncontaminated soil, prairie hay, buffalo manure, and commercial fertilizers, and then spread in a shallow layer over uncontaminated soil to create a landfarm. During a two-year period, this landfarm was monitored for aerobic and anaerobic bacteria, soil gases indicative of microbial activity, and changes in the concentration of total petroleum hydrocarbons (TPH).
- Durand, J. P. **Role of GC in petroleum industry and petrochemistry. From hydrocarbon quantitative analysis to simulated distillation.** *Analisis*. January-February 1998; 26 (1):M17-M21. ISSN: 0365-4877.
- Dutta, T. K.; Harayama, S. **Fate of crude oil by the combination of photooxidation and biodegradation.** *Environmental Science & Technology*. 2000; 34 (8):1500-1505. ISSN: 0016-7037. In a controlled experiment, an oil slick of h-crude oil was photooxidized over a period of 8 weeks. Several samples were incubated without lid in a chamber whose temperature was controlled to 20 °C. It was determined that natural microbial populations in seawater biodegraded 28% of crude oil under these conditions when sufficient nutrients were supplied to the seawater. It is concluded that photooxidation increased the biodegradation of susceptible crude oil.
- Ehrhardt, M. G.; Bicego, M. C.; Weber, W. R. **Photo-oxidation of 1-methylnaphthalene dissolved in seawater and exposed to sunlight under quasi-environmental conditions.** *Journal of Photochemistry and Photobiology A - Chemistry*. August 15, 1997; 108 (2/3):253-259. ISSN: 1010-6030.
- Ekundayo, E. O.; Obuekwe, C. O. **Hydrocarbon utilization in yeast isolates found to grow in association with petroleum in a polluted ultisol of midwestern Nigeria.** *Environmental Monitoring and Assessment*. 2000; 63 (2):381-387. ISSN: 0167-6369.
- Ekundayo, E.O.; Obuekwe, C. O. **Effects of an oil spill on soil physico-chemical properties of a spill site in a typic udipsamment of the Niger Delta Basin of Nigeria.** *Environmental Monitoring and Assessment*. 2000; 60 (2):235-249. ISSN: 0167-6369.
- Faure, P.; Landais, P.; Schlepp, L.; Michels, R. **Evidence for diffuse contamination of river sediments by road asphalt particles.** *Environmental Science & Technology*. 2000; 34 (7):1174-1181. ISSN: 0013-936X. Road asphalt particles are used to confirm saturated hydrocarbons in contaminated sediment samples collected in different rivers from Alsace-Lorraine.
- Fernandes, M. B.; Sicre, M. A.; Boireau, A.; Tronczynski, J. **Polyaromatic hydrocarbon (PAH) distributions in the Seine River and its estuary.** *Marine Pollution Bulletin*. November 1997; 34 (11):857-867. ISSN: 0025-326X. Water samples from the Seine River and its estuary were taken in October 1993 to determine dissolved and particulate PAH levels and to examine the influence of tidal cycles on dispersal of riverborne PAHs.
- Ferrer, R.; Guiteras, J.; Beltran, J. L. **Development of fast-scanning fluorescence spectra as a detection system for high-performance liquid chromatography: determination of polycyclic aromatic hydrocarbons in water samples.** *Journal of Chromatography A*. August 29, 1997; 779 (1/2):123-130. ISSN: 0021-9673. Chromatographic column effluent was scanned for emission spectra. Fluorescence intensity for each wavelength corresponded to different portions of the effluent, so raw chromatograms were corrected by interpolation.

- Fingas, M. F., et al. **The effect of energy: settling time and shaking time on the swirling flask dispersant apparatus.** *Spill Science & Technology Bulletin*. 1996; 3 (4):193-194. ISSN: 1353-2561.
Dispersion effectiveness began between 100 and 150 rpm and increased slowly with increasing rotational speed. Settling time changed effectiveness between 5 and 80 minutes, and shaking did not alter effectiveness significantly.
- Fleck, L. C.; Bicca, F. C.; Ayub, M A Z. **Physiological aspects of hydrocarbon emulsification, metal resistance and DNA profile of biodegrading bacteria isolated from oil polluted sites.** *Biotechnology Letters*. 2000; 22 (4):285-289. ISSN: 0141-5492.
The emulsification index is a method extensively used to identify and quantify biosurfactants in microbial cultures. Diesel oil was used as the hydrocarbon source to evaluate seven bacterial strains from the production of biosurfactants isolated from different oil contaminated sites. The production of these biosurfactants were also used to determine their bioremediation effectiveness, sensitivity to heavy metals, and for coding genes in the chromosomal DNA.
- Foght, J., et al. **Effect of nitrogens source on biodegradation of crude oil by a defined bacterial consortium incubated under cold, marine conditions.** *Environmental Technology*. 1999; 20 (8):839-849. ISSN: 0959-3330.
- Fukuoka, S., et al. **Biodegradation of C-Heavy oil using floatable pellets containing nutrients and an oil-degrading marine microbial consortium.** *Seibutsu Kogaku Kaishi*. 1999; 77 (5):181-186. ISSN: 0919-3758.
- Gaines, R. B.; et al. **Oil spill source identified by comprehensive two-dimensional gas chromatography.** *Environmental Science & Technology*. 1999; 33 (2):2106-2112. ISSN: 0013-936X.
The powerful petroleum component separation and identification capability of two-dimensional gas chromatography is used to match on of two possible sources to a marine diesel fuel spill.
- Gao, J. P.; Maguhn, J.; Spitzauer, P.; Kettrup, A. **Distribution of polycyclic aromatic hydrocarbons (PAHs) in pore water and sediment of a small aquatic ecosystem.** *International Journal of Environmental Analytical Chemistry*. 1998; 69 (3):227-242. ISSN: 0306-7319.
- Gilbert, F., et al. **Changes in aliphatic hydrocarbon tracer composition during the digestive process of the marine worm, *Nereis virens*: preliminary results.** *Chemosphere*. February 1998; 36 (3):553-560. ISSN: 0045-6535.
- Gogou, A. I.; Apostolaki, M.; Stephanou, E.G. **Determination of organic molecular markers in marine aerosols and sediments: one-step flash chromatography compound class fractionation and capillary gas chromatographic analysis.** *Journal of Chromatography A*. March 13, 1998; 799 (1/2):215-231. ISSN: 0021-9673.
- Gold-Bouchot, G.; Zavala-Coral, M.; Zapata-Perez, O.; Ceja-Moreno, V. **Hydrocarbon concentrations in oysters (*Crassostrea virginica*) and recent sediments from three coastal lagoons in Tabasco, Mexico.** *Bulletin of Environmental Contamination and Toxicology*. September 1997; 59 (3):430-437. ISSN: 0007-4861.
Tabasco, Mexico is a major producer of eastern oysters and crude oil. Trace metals and hydrocarbon residue concentrations were measured in oysters and sediments taken from three of Tabasco's main lagoons: El Carmen, La Machona and Mecocacan.
- Gordon, D. S.; Flemings, P. B. **Generation of overpressure and compaction-driven fluid flow in a Plio-Pleistocene growth-faulted basin, Eugene Island 330, offshore Louisiana.** *Basin Research*. June 1998; 10 (2):177-196. ISSN: 0950-091X.
A hydrodynamic model was applied to four sites in the EI 330 field. The observed pressure and porosity profiles were reproduced if sediment loading is the only pressure source, and that permeability is a function of lithology and porosity.
- Gorshteyn, A. Y.; et al. **Subsurface detection of environmental pollutants.** *Instrumentation Science & Technology*. 1999; 27 (2):111-121. ISSN: 1073-9149.
A new *in situ* sampling device capable of thermally desorbing organics bound to subsurface soils at depths to 20m is described and demonstrated with depth profiles of PAH concentrations.
- Graham, D. W.; et al. **Effects of nitrogen and phosphorus supply on hexadecane biodegradation in soil systems.** *Water Air and Soil Pollution*. 1999; 111 (1/4):1-18. ISSN: 0049-6979.
The highest yields of hexadecane biodegradation occurred at optimal nitrogen/phosphorus supply ratios, whereas nitrogen/phosphorus limitation resulted in lower yields. Bioavailable fractions of naturally occurring soil nitrogen/phosphorus should be incorporated when estimating the most suitable nutrient formulation for a given contamination scenario.

- Grice, K.; Alexander, R.; Kagi, R. I. **Diamondoid hydrocarbon ratios as indicators of biodegradation in Australian crude oils.** *Organic Geochemistry*. 2000; 31 (1):67-73. ISSN: 0146-6380. A series of crude oils reservoired in two Australian sedimentary basins, the Gippsland Basin and the Carnarvon Basin, were used to investigate the effects of biodegradation on diamondoid distributions in petroleum.
- Gudebska, J.; Kaminski, M. **The method of identification of low-volatile petroleum products utilizing thin-layer chromatography.** *Chemia Analityczna*. 1998; 43 (5):859-865. ISSN: 0009-2223.
- Guerin, T. E. **The differential removal of aged polycyclic aromatic hydrocarbons from soil during bioremediation.** *Environmental Science and Pollution Research*. 2000; 7 (1):19-26. ISSN: 0944-1344.
- Guha, S.; Jaffe, P. R.; Peters, C. A. **Bioavailability of mixtures of PAHs partitioned into the micellar phase of a nonionic surfactant.** *Environmental Science & Technology*. August 1, 1998; 32 (15):2317-2324. ISSN: 0013-936X.
- Gurgey, K. **Geochemical characteristics and thermal maturity of oils from the Thrace Basin (Western Turkey) and western Turkemenistan.** *Journal of petroleum Geology*. 1999; 22 (2):167-189. ISSN: 0141-6421.
The relationship between the oils from the Thrace Basin and from western Turkemenistan was investigated to clarify the distribution of Oligocene source rocks and the timing of hydrocarbon generation and oil maturity.
- Guzman-Vega, M. A.; Mello, M. R. **Origin of oil in the Sureste Basin, Mexico.** *AAPG Bulletin: American Association of Petroleum Geologists*. 1999; 83 (7):1068-1095. ISSN: 0149-1423.
Four major age-source related oil families have been identified in the Sureste Basin, Mexico, using geochemical and biological marker analyses of oils and rock samples. This analysis will be useful in predicting differences in oil compositions from both offshore and onshore reservoirs.
- Harayama, S.; Kishira, H.; Shutsubo, K. **Petroleum biodegradation in marine environments.** *Molecular Marine Microbiology*. 2000; 43 (1):69-90.; ISBN: 1-898486-20-4.
- Hennessy, A. J.; Neville, A.; Roberts, K. J. **An examination of additive-mediated wax nucleation in oil pipeline environments.** *Journal of Crystal Growth*. 1999; 199:830-837. ISSN: 0022-0248.
The effects of two additives, alkyl derivatives of polymeric acrylates, on the surface and bulk nucleation of wax crystals from hydrocarbon solution phases were examined.
- Hinchee, Robert E.; Kittel, Jeffrey A.; Reisinger, H. James. **Applied Bioremediation of Petroleum Hydrocarbons.** Columbus, OH: Battelle Press; 3 (6);550 pgs.; ISBN: 1-57477-007-1.
This volume covers bioremediation markets, general technology overviews, and selected case studies of crude oil spills in marine environments.
- Ho, K.; et al. **The chemistry and toxicity of sediment affected by oil from the North Cape spill into Rhode Island Sound.** *Marine Pollution Bulletin*. 1999; 38 (5):314-323. ISSN: 0025-326X.
Two subtidal sediments were followed for more than 9 months to determine the toxicity and chemistry of weathered oil following the North Cape oil spill. PAH and alkane concentrations in sediment samples from the spill area and a nearby marina were compared.
- Hollender, J., et al. **Extraction of polycyclic aromatic hydrocarbons from polluted soils with binary and ternary supercritical phases.** *Journal of Chromatography A*. August 1, 1997; 776 (2):233-243. ISSN: 0021-9673.
- Holman, H. Y.; Tsang, Y. W. **Mineralization of sparsely water-soluble polycyclic aromatic hydrocarbons in a water table fluctuation zone.** *Environmental Science & Technology*. 1999; 33 (11):1819-1824. ISSN: 0013-936X.
The changing oxygen content and depletion of mineral nutrients controlled PAHs within a highly diesel-contaminated water table fluctuation zone. These changes were observed in the mineralization behavior of the water-soluble PAHs.
- Hostettler, F. D.; Rosenbauer, R. J.; Kvenvolden, K. A. **PAH refractory index as a source discriminate of hydrocarbon input from crude oil and coal in Prince William Sound, Alaska.** *Organic Geochemistry*. 1999; 30 (8B):873-879. ISSN: 0146-6380.
A PAH refractory index is utilized to differentiate three different oils, as well as to provide evidence that coal, not oil, is the dominant source of polycyclic aromatic hydrocarbons which are the prominent constituents of marine sediments from Prince William Sound and the Gulf of Alaska.

- Huang, H. P.; Pearson, M. J. **Source rock palaeoenvironments and controls on the distribution of dibenzothiophenes in lacustrine crude oils, Bohai Bay Basin, eastern China.** *Organic Geochemistry*. 1999; 30 (11):1455-1470. ISSN: 0146-6380.
The purpose of the investigation was to evaluate the relationship of dibenzothiophene maturity parameters to source depositional environment and oil maturity in the context of Bohai Bay Basin. No rock samples were available to the present study, but instead sources are inferred from geological considerations and the geochemistry of the oils and by reference to published studies.
- Hunkeler, D.; et al. **Engineered *in situ* bioremediation of a petroleum hydrocarbon-contaminated aquifer: assessment of mineralization based on alkalinity, inorganic carbon and stable carbon isotope balances.** *Journal of Contaminant Hydrology*. 1999; 37 (3/4):201-223. ISSN: 0169-7722.
Changes in concentrations of oxidants (O₂ and NO₃), reduced species (methane, alkalinity, dissolved inorganic carbon), and stable carbon isotope ratios were used to assess petroleum hydrocarbon mineralization at the field scale during bioremediation of a diesel fuel contaminated aquifer in Menziken, Switzerland. Mineralization may be underestimated if it is determined only from changes in concentrations.
- Jackson, A.; Pardue, J. H. **Seasonal variability of crude oil respiration potential in salt and fresh marshes.** *Journal of Environmental Quality*. July-August 1997; 26 (4):1140-1146. ISSN: 0047-2425.
A salt- and a fresh-water marsh in Louisiana's Barataria basin were studied for one year for signs of seasonal variation in crude oil mineralization. Both marshes were found to have seasonal variations, with the salt marsh having the greatest variability.
- Jokuty, P., et al. **A new method for the determination of wax content of crude oils.** *Spill Science & Technology*. 1996; 3 (4):195-198. ISSN: 1353-2561.
Open column chromatography separations of hydrocarbon groups produced saturate fractions, which were analyzed by gas chromatography with flame ionization detection.
- Jovancicevic, B., et al. **Identification of oil-type pollution in recent sediments.** *Fresenius Environmental Bulletin*. November-December 1997; 6 (11/12):667-673. ISSN: 1018-4619.
- Kadnar, R. **Determination of amines used in the oil and gas industry (upstream section) by ion chromatography.** *Journal of Chromatography A*. 1999; 850 (1/2):289-295. ISSN: 0021-9673.
- Kanaly, R.; Bartha, R.; Fogel, S.; Findlay, M. **Biodegradation of 14-C benzo[a]pyrene added in crude oil to uncontaminated soil.** *Applied and Environmental Microbiology*. November 1997; 63 (11):4511-4515. ISSN: 0099-2240.
Crude oil spiked with [7-C-14] BaP and unlabeled BaP was added to soil with no known pollution history, to investigate the possible cometabolic biodegradation of benzo[a]pyrene.
- Karlitschek, P., et al. **Detection of aromatic pollutants in the environment by using UV-laser-induced fluorescence.** *Applied Physics B - Lasers and Optics*. October 1998; 67 (4):497-504. ISSN: 0946-2171.
A compact, mobile, battery-operated laser induced fluorescence system is introduced. Sixteen PAHs are tested to show the abilities of the system.
- Katritzky, A. R.; Yang, B. Z.; Tack, R. D. **Synthesis of dendramines, dendramides and their new application in the oil industry.** *Journal of the Chinese Chemical Society*. December 1997; 44 (6):575-580. ISSN: 0009-4536.
- Kazunga, C.; Aitken, M. D. **Products from the incomplete metabolism of pyrene by polycyclic aromatic hydrocarbon-degrading bacteria.** *Applied and Environmental Microbiology*. 1999; 66 (5):1917-1922. ISSN: 0099-2240.
Objectives of this study were to isolate and identify the significant products from the incomplete metabolism of pyrene by four bacterial strains, evaluate the potential degradability of these metabolites by an organism known to grow on pyrene as a sole carbon source, and determine the bacteria's capability of mineralizing pyrene.
- Kira, S.; Nogami, Y.; Ito, T.; Hayatsu, H. **Measurement of a time-weighted average concentration of polycyclic aromatic hydrocarbons in seawater: an improved procedure of blue rayon hanging technique for monitoring benzo[a]pyrene.** *Marine Environmental Research*. 1998; 46 (1/5):267-271. ISSN: 0141-1136.
The amount of PAH adsorbed to the blue rayon depends on the intensity of the water stream and the concentration of PAH contamination. If modified to take into account water stream intensity, the blue rayon method appeared to be a useful sampling tool.
- Koprivnjak, J. F.; Poissant, L. **Evaluation and application of a fugacity model to explain the partitioning of contaminants in the St. Lawrence River valley.** *Water Air and Soil Pollution*. July 1997; 97 (3/4):379-395. ISSN: 0049-6979.

- Korda, A.; Santas, P.; Tenente, A.; Santas, R. **Petroleum hydrocarbon bioremediation: sampling and analytical techniques, *in situ* treatments and commercial microorganisms currently used.** *Applied Microbiology and Biotechnology*. December 1997; 48 (6):677-686. ISSN: 0175-7598.
The sampling techniques, treatment and bioremediation of petroleum are described and analyzed for effectiveness.
- Kropp, K. G.; Dedorak, P. M. **A review of the occurrence, toxicity, and biodegradation of condensed thiophenes found in petroleum.** *Canadian Journal of Microbiology*. July 1998; 44 (7):605-622. ISSN: 0008-4166.
- Krupik, J.; Oktavec, D.; Scauni, I.; Dauik, P. **Problems with the determination of petroleum hydrocarbons in environmental samples.** *Critical Reviews in Analytical Chemistry*. 1999; 29 (2):90-91. ISSN: 1040-8347.
Weathering can affect both GC and IR analysis of petroleum hydrocarbons in environmental samples. The aim of this paper is to show problems connected with the calibration of C20-C44 petroleum hydrocarbons by GC-FID and IR spectrometry. Both GC-FID as well as IR spectrometric method requires standards for which group composition is matched with that present in the environmental samples.
- Krupik, J.; Oswald, P.; Spanik, I.; Benicka, E.; Dauik, P. **On the capillary gas chromatographic determination of petroleum hydrocarbons in environmental samples.** *Critical Reviews in Analytical Chemistry*. 1999; 29 (2):92-93. ISSN: 1040-8347.
In order to identify and quantitatively analyze petroleum hydrocarbons in environmental samples by CGC-FID, it is necessary to use reference material, which provides not only chromatograms but also the group composition similar to that in the considered samples.
- Law, R. J.; Klungsoyr, J.; Freriks, I. L. **The QUASIMEME Laboratory Performance Study of polycyclic aromatic hydrocarbons (PAH): assessment of the first three rounds, 1994-1995.** *Marine Pollution Bulletin*. January-June 1997; 35 (1/6 Sp. Iss.):64-77. ISSN: 0025-326X.
The Laboratory Performance Study was undertaken to improve PAH measurement. Calibration procedures and errors in calculating results are considered the greatest performance limiting factors when measuring PAHs.
- Ledreau, Y.; Jacquot, F.; Doumenq, P.; Guiliano, M. **Hydrocarbon balance of a site which had been highly and chronically contaminated by petroleum wastes of a refinery (from 1956 to 1992).** *Marine Pollution Bulletin*. June 1997; 34 (6):456-468. ISSN: 0025-326X.
Core samples were taken of a contaminated area in the Gulf of FOS in South France after the pollution from a refinery ceased.
- Lee, K.; de Mora, S. ***In situ* bioremediation strategies for oiled shoreline environments.** *Environmental Technology*. 1999; 20 (8):783-794. ISSN: 0959-3330.
In situ bioremediation accelerates the natural biodegradation process of oil. It is also recommended for use following the physical removal of bulk oil. Its operational advantage is that it breaks down and/or removes the residual contaminants in place.
- Lee, K.; Merlin, F. X. **Bioremediation of oil on shoreline environments: development of techniques and guidelines.** *Pure and Applied Chemistry*. 1999; 71 (1):161-171. ISSN: 0033-4545.
This review describes the latest advances in oil spill bioremediation strategies, highlights new concepts under consideration, and identifies the success factors to consider in the application of these technologies.
- Lee, B.; Yi, J. **A statistical approach for determining the environmental impact of polynuclear aromatic hydrocarbons in an oil spill-contaminated coastal area.** *Environmental Pollution*. 1999; 105 (3):391-396. ISSN: 0269-7491.
In order to develop a statistical approach for determining the extent for pollution in a large, heterogeneous area, 167 sediment samples were collected in an intertidal zone and 16 PAH concentrations were measured. Two representatives PAHs were selected and the extent of pollution could be appraised by the concentration converted with the corresponding Toxicity Equivalence Factors (TEFs) of each PAH.
- Lee, K. **Bioremediation of Oil Impacted Shorelines.** Murphy, T. ; Munawar, M. *Aquatic Restoration in Canada (Series: ECOVISION WORLD MONOGRAPH SERIES)*. Ah Leiden, Netherlands: Backhuys Publishers; 1999;69-85.; ISBN: 90-5782-049-8.
- LeFloch, S., et al. **A field experimentation on bioremediation: BIOREN.** *Environmental Technology*. 1999; 20 (8):897-907. ISSN: 0959-3330.
This paper describes the field experiment, implementation and preliminary results of bioremediation agents BIOREN 1 and BIOREN 2. These agents enhance the bacterial activities of the biodegradation process immediately following an oil spill.

- Li, G. H.; Zhang, X.; Huang, W. **Enhanced biodegradation of petroleum hydrocarbons in polluted soil.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering.* 2000; 35 (2):177-188. ISSN: 1093-4529.
- Liebeg, E. W.; Cutright, T. J. **The investigation of enhanced bioremediation through the addition of macro and micronutrients in a PAH contaminated soil.** *International Biodeterioration & Biodegradation.* 1999; 44 (1):55-64. ISSN: 0964-8305.
Respirometer studies were conducted to determine the effects of adding macro and/or micronutrients for enhancing the bioremediation of PAH and/or petroleum contaminates soils.
- Lin, Q., et al. **Effects of bioremediation agents on oil degradation in mineral and sandy salt marsh sediments.** *Environmental Technology.* 1999; 20 (8):825-837. ISSN: 0959-3330.
Bioremediation agents, fertilizer, microbial product and soil oxidants were used as a means of enhancing oil biodegradation in coastal mineral and sandy marsh substrates in a controlled greenhouse environment. This experiment was conducted to investigate the most effective bioremediation agent for an oil spill cleanup technique in a wetland environment.
- Lin, Q. X.; Mendelsohn, I. A. **The combined effects of phytoremediation and biostimulation in enhancing habitat restoration and oil degradation of petroleum contaminated wetlands.** *Ecological Engineering.* June 30, 1998; 10 (3):263-274. ISSN: 0925-8574.
Spartina alterniflora and *Spartina patens* were used to test the effect of plant transplants and fertilizer applications on soil contaminated with South Louisiana crude oil. The application of fertilizer greatly increased the remediation of the soil with transplants.
- Lohmannsroben, H. G.; Roch, T.; Schultze, R. H. **Laser-induced fluorescence (LIF) spectroscopy for *in situ* analysis of petroleum products and biological oils in soils.** *Polycyclic Aromatic Compounds.* 1999; 13 (2):165-174. ISSN: 1040-6638.
- Lombas Garcia, E.; Gans, O.; Krska, R.; Grasserbauer, M. **Supercritical fluid extraction versus ultrasonic extraction for the analysis of polycyclic aromatic hydrocarbons from reference sediments.** *International Journal of Environmental Analytical Chemistry.* 1998; 72 (4):289-300. ISSN: 0306-7319.
- Losh, S. **Oil migration in a major growth fault: structural analysis of the Pathfinder core, South Eugene Island Block 330, offshore Louisiana.** *AAPG Bulletin - American Association of Petroleum Geologists.* September 1998; 82 (9):1694-1710. ISSN: 0149-1423.
The faults and fractures in the deepest part of the core were the only ones containing oil, and the oil's restriction to the youngest sampled portion of the fault zone indicates that the oil only migrated along the active parts of the fault zones.
- Lun, R.; Lee, K.; De Marco, L. **A model of the fate of polycyclic aromatic hydrocarbons in the Saguenay Fjord, Canada.** *Environmental Toxicology and Chemistry.* 1998; 17 (2):333-341. ISSN: 0730-7268.
The model combines defined loadings of PAHs from the atmosphere and industrial sources with advective flow and atmospheric deposition rates to predict quantities, concentrations, and transport and transformation rates. Modeled concentrations of benzo[a]pyrene agreed with reported concentrations.
- Majid, A.; et al. **Treatment of used diesel invert drilling mud to remove hydrocarbons, fix lead, and leach brine.** *Journal of Soil Contamination.* 1999; 8 (2):255-283. ISSN: 1058-8337.
- Maki, H., et al. **Use of wastewater sludge for the amendment of crude oil bioremediation in meso-scale beach simulating tanks.** *Environmental Technology.* 1999; 20 (6):625-632. ISSN: 0959-3330.
Meso-scale beach simulating tanks were setup to investigate the effects of wastewater sludge on microbial degradation of crude oil. Dehydrated-wastewater sludge and liquid-wastewater sludge exerted almost the same effect as slow-releasing synthetic fertilizers in stimulating the microbial degradation. Results conclude that wastewater sludge is as useful as fertilizer for crude oil bioremediation.
- Maldonado, Christina; Bayona, Josep M.; Bodineau, Laurent. **Sources, distribution, and water column processes of aliphatic and polycyclic aromatic hydrocarbons in Northwestern Black Sea water.** *Environmental Science & Technology.* 1999; 33 (16):2693-2702. ISSN: 0013-936X.
Three vertical transect profiles from the continental shelf, and deep basin of the western Black Sea, were surveyed for concentrations of aliphatic and aromatic hydrocarbons. Highest concentrations of hydrocarbons were found in the Danube, Dnieper, and Dniester River estuaries and other point sources of pollution located offshore Romania and Bulgaria where oil production and refining is carried out.

- Mansuy, L.; Philp, R. P.; Allen, J. **Source identification of oil spills based on the isotopic composition of individual components in weathered oil samples.** *Environmental Science & Technology*. December 1997; 31 (12):3417-3425. ISSN: 0013-936X. Weathered oil samples can be traced using gas chromatography/isotope ratio mass spectrometry (GC/IRMS) as a complimentary correlation technique to GC and GC/MS.
- Margesin, R.; Schinner, F. **Biological decontamination of oil spills in cold environments.** *Journal of Chemical Technology and Biotechnology*. 1999; 74 (5):381-389. ISSN: 0268-2575. Complete oil elimination is not possible in cold environments. Biological decontamination methods do contribute considerably to the removal of the oil spills. Unresolved questions that deal with the bioavailability of compounds accessible to microorganisms for biodegradation and bioremediation are discussed.
- Margesin, R.; Schinner, F. **Effect of temperature on oil degradation by a psychrotrophic yeast in liquid culture and in soil.** *FEMS Microbiology Ecology*. November 1997; 24 (3):243-249. ISSN: 0168-6496. Biodegradation of diesel oil was tested in a mineral medium and in soil. Biodegradation increased with time and temperature, and was lower in mineral medium than in soil.
- Margesin, R.; Schinner, F. **Laboratory bioremediation experiments with soil from a diesel-oil contaminated site - significant role of cold-adapted microorganisms and fertilizers.** *Journal of Chemical Technology and Biotechnology*. September 1997; 70 (1):92-98. ISSN: 0268-2575. Diesel oil degradation as effected by incubation temperatures, addition of an inorganic fertilizer, and indigenous soil microorganisms was investigated.
- Margesin, R.; Zimmerbauer, A.; Schinner, F. **Soil lipase activity - a useful indicator of oil biodegradation.** *Biotechnology Techniques*. 1999; 13 (12):859-863. ISSN: 0951-208X. The usefulness of soil lipase activity was evaluated as a tool to monitor oil biodegradation in soil. Over a period of 116 days, two decontamination techniques were used in a laboratory study, to measure hydrocarbon degradation by indigenous soil microorganisms, soil lipase activity and the number of oil-degrading microorganisms in unfertilized and fertilized soil.
- Marquez-Rocha, F. J.; Hernandez-Rodriguez, V. Z.; Vazquez Duhalt, R. **Biodegradation of soil-adsorbed polycyclic aromatic hydrocarbons by the white rot fungus, *Pleurotus ostreatus*.** *Biotechnology Letters*. 2000; 22 (6):469-472. ISSN: 0141-5492.
- McBride, B. C.; Weimer, P.; Rowan, M. G. **The effect of allochthonous salt on the petroleum systems of northern Green Canyon and Ewing Bank (offshore Louisiana), northern Gulf of Mexico.** *AAPG Bulletin - American Association of Petroleum Geologists*. May 1998; 82 (5 Part B):1083-1112. ISSN: 0149-1423. Petroleum migration pathways and zones of concentration are predicted by integrating information on potential source rocks, structural restorations, thermal maturation modelling, regional salt maps and petroleum systems logic.
- Means, J. C. **Compound-specific gas chromatographic/mass spectrometric analysis of alkylated and parent polycyclic aromatic hydrocarbons in waters, sediments, and aquatic organisms.** *Journal of Aoac International*. May-June 1998; 81 (3):657-672. ISSN: 1060-3271.
- Mearns, A. J. **Cleaning oiled shores: putting bioremediation to the test.** *Spill Science & Technology Bulletin*. December 1997; 4 (4):209-217. ISSN: 1353-2561. This article gives a basic overview of bioremediation and how biodegradation of oiled shorelines can be aided by the application of fertilizers.
- Michel, Jacqueline; Zengel, Scott. **Monitoring of oysters and sediments in Acajutla, El Salvador.** *Marine Pollution Bulletin*. 1998; 36 (4):256-266. ISSN: 0025-326X. Petroleum hydrocarbons, chlorinated organic compounds, pesticides and trace elements were analyzed in oysters (*Ostrea irridescens*) and fine-grained sediments from Acajutla, El Salvador. Oysters collected in the area contain only background levels of PAHs, with the exception of oysters near an industrial discharge canal, which contained background levels 100 times greater.
- Mille, G.; Munoz, D.; Jacquot, F.; Rivet, L.; Bertrand, J. -C. **The Amoco Cadiz oil spill: evolution of petroleum hydrocarbons in the Ile Grande salt marshes (Brittany) after a 13-year period.** *Estuarine Coastal and Shelf Science*. 1998; 47 (5):547-559. ISSN: 0272-7714. Thirteen years after the Amoco Cadiz oil spill; sediments in the Ile Grande salt marshes were analyzed for residual hydrocarbons. Hydrocarbon levels drastically reduced over the 13-year period, but to differing degrees, and some changes in biomarker distributions were observed.

- Minero, C.; Maurino, V.; Pelizzetti, E. **Photocatalytic transformations of hydrocarbons at the seawater air interface under solar radiation.** *Marine Chemistry*. November 1997; 58 (3/4):361-372. ISSN: 0304-4203.
Photocatalytic oxidation of petroleum constituents dodecane and toluene was studied in pure water and in simulated seawater with simulated solar radiation.
- Mohamed, A. Y.; Pearson, M. J.; Ashcroft, W. A.; Iliffe, J. E.; Whiteman, A. J. **Modelling petroleum generation in the Southern Muglad rift basin, Sudan.** *AAPG Bulletin American Association of Petroleum Geologists*. 1999; 83 (12):1943-1964. ISSN: 0149-1423.
A 120-km-long northeast-southwest cross section of the Southern Muglad Rift basin, Sudan, is used as a reference for modelling of hydrocarbon evolution. The section is near the Unity and Kaikang areas, which provide well control on the structure interpreted from gravity and seismic reflection profiles. Using measured vitrinite data as a calibrant, maturity can be modeled equally well with a constant paleoheat flow similar to the present day or with a complex heat flow pattern related to rifting.
- Mudge, S. M.; Pereira, G. **Stimulating the biodegradation of crude oil with biodiesel preliminary results.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):353-355. ISSN: 1353-2561.
During a laboratory experiment, biodiesel was added to sediments with a range of grain sizes to demonstrate the potential for removing crude oil from contaminated beaches. The biodiesel appears to provide an available carbon source for the microorganisms, which then co-metabolises the crude oil components. Biodiesel acts as a non-volatile organic solvent and dissolves the crude oil, including weathered oil.
- Mueller, D. C.; Bonner, J. S.; McDonald, S. J.; Autenrieth, R. L. **Acute toxicity of estuarine wetland sediments contaminated by petroleum.** *Environmental Technology*. 1999; 20 (8):875-882. ISSN: 0959-3330.
A major petroleum pipeline ruptured in an estuarine marshland during a flood near Houston Texas. Following the spill, samples were collected over a seven-month period to determine acute sediment toxicity, and measured by performing the Microtox bioassay 100% test on elutriates from wet sediment samples collected from experimental plots in the study area.
- Mulder, H., et al. **Effect of nonionic surfactants on naphthalene dissolution and biodegradation.** *Biotechnology and Bioengineering*. November 20, 1998; 60 (4):397-407. ISSN: 0006-3592.
- Munoz, D., et al. **New approach to study of spilled crude oils using high resolution GC-MS (SIM) and metastable reaction monitoring GC-MS-MS.** *Talanta*. December 12, 1997; 45 (1):1-12. ISSN: 0039-9140.
Three analytic MS approaches (classical quadruple, high resolution, and metastable reaction monitoring) were used to analyze PAH markers in petroleum-polluted soils over 8 years.
- Muzalevskii, A. A. **Identification of sources of water pollution with petroleum products.** *Journal of Analytical Chemistry*. 1999; 54 (12):1100-1105. ISSN: 1061-9348.
A new procedure is proposed for identifying sources of water pollution with petroleum products using low-resolution spectra or chromatograms.
- Napitupulu, H.; Ellis, L.; Mitterer, R. M. **Post-generative alteration effects on petroleum in the onshore Northwest Java basin, Indonesia.** *Organic Geochemistry*. 2000; 31 (4):295-315. ISSN: 0146-6380.
Two oil families associated with source rocks are identified in the Talangakar formation. One oil type is derived from marine influenced delta-front to prodelta depositional settings, while the other is possibly from the delta-plain to delta-front depositional environment. Correlation of families of oil to depositional environments allows for a more refined approach in identification of hydrocarbon mitigation pathways in the Northwest Java Basin.
- Nemirovskaya, I. A. **Hydrocarbons in estuarine sediments from the northwestern area of the Black Sea.** *Geokhimiya*. 1999; 7:727-733. ISSN: 0016-7525.
- Nemoto, S., et al. **Analyses for petroleum-related contaminants in seafoods by GC/MS (SIM).** *Journal of the Food Hygienic Society of Japan*. February 1998; 39 (1):31-38. ISSN: 0015-6426.
- Novotny, C., et al. **Extracellular oxidative enzyme production and PAH removal in soil by exploratory mycelium of white rot fungi.** *Biodegradation*. 1999; 10 (3):159-168. ISSN: 0923-9820.
- Nytoft, H. P.; Bojesen-Koefoed, J. A.; Christiansen, F. G. **C₂₆ and C₂₈-C₃₄ 28-norhopanes in sediments and petroleum.** *Organic Geochemistry*. 2000; 31 (1):25-39. ISSN: 0146-6380.

- Odden, W.; Patience, R. L.; Vangraas, G. W. **Application of light hydrocarbons (C₄-C₁₃) to oil/source rock correlations: a study of the light hydrocarbon compositions of source rocks and test fluids from offshore Mid-Norway.** *Organic Geochemistry*. 1998; 28 (12):823-847. ISSN: 0146-6380. The samples from the Early Jurassic Åre Formation had more aromatics and cyclohexanes, and the samples from the Late Jurassic Spekk Formation were richer in cyclopentanes and acyclic hydrocarbons. The Spekk Formation is the source for most of the oil fields in Mid-Norway.
- Odden, W. **A study of natural and artificially generated light hydrocarbons (C₄-C₁₃) in source rocks and petroleum fluids from offshore Mid-Norway and the southernmost Norwegian and Danish sectors.** *Marine and Petroleum Geology*. 1999; 16 (8):747-770. ISSN: 0264-8172. Source rock samples are compared with the light fraction generated by pyrolysis products of the kerogens to the "free" or "natural" light hydrocarbon composition obtained by thermal extraction-GC. These different analytical techniques can be substituted for both data types even though there are large differences between the composition of the "free" C₄-C₁₃ hydrocarbon fractions and the same fraction generated by thermal extraction-GC.
- Oh, Y. S.; Choi, W. Y.; Lee, Y. H.; Choi, S. C.; Kim, S. J. **Biological treatment of oil-contaminated sand: comparison of oil degradation based on thin-layer chromatography/flame ionization detector and respirometric analysis.** *Biotechnology Letters*. 2000; 22 (7):595-598. ISSN: 0141-5492. Two different methods for measuring the biodegradation of oil were used to analyze samples of contaminated sand. Inorganic nutrients and oil-degrading yeast were added to the sand to increase degradation levels. Carbon dioxide levels were monitored in the experiments.
- Oudot, J.; Merlin, F. X.; Pinvidic, P. **Weathering rates of oil components in a bioremediation experiment in estuarine sediments.** *Marine Environmental Research*. 1998; 45 (2):113-125. ISSN: 1441-1136. Biodegradation rates of crude oil are influenced by the addition of fertilizers were studied over a 9-month period in mid-tide sediments in the bay of Brest, France. It is suggested that because of high background levels of nitrogen and phosphorus, the addition of fertilizers had no significant affect on biodegradation rates.
- Pairazian, V. V. **A review of the petroleum geochemistry of the Precaspian Basin.** *Petroleum Geoscience*. 1999; 5 (4):361-369. ISSN: 1354-0793.

- Pardos, J.; et al. **Fate of a new silicone-based oil-treating agent and its effects on marine microbial communities.** *Environmental Toxicology and Chemistry*. 1999; 18 (5):819-827. ISSN: 0730-7268. A oil based treating agent which traps hydrocarbons by forming a floating silicone-hydrocarbon solid residue, was tested for its effectiveness to stimulate phytoplankton and microbial communities.
- Peters, K. E.; Clutson, M. J.; Robertson, G. **Mixed marine and lacustrine input to an oil-cemented sandstone breccia from Brora, Scotland.** *Organic Geochemistry*. 1999; 30 (4):237-248. ISSN: 0146-6380. Hydrocarbon biomarkers are used to recognize mixing of crude oils from several sources in an unusual oil-cemented, brecciate sandstone cobble collected from a beach near Brora, Scotland.
- Peters, K. E.; Fraser, T. H.; Amris, W.; Rustanto, B.; Hermanto, E. **Geochemistry of crude oils from eastern Indonesia.** *AAPG Bulletin American Association of Petroleum Geologists*. 1999; 83 (12):1927-1942. ISSN: 0149-1423. Chemometric analysis of source-related biomarker and stable carbon isotopic data was based on 13 source-related parameters for the oils described in this paper. High-resolution geochemistry shows genetic relationships among 27 crude oils from eastern Indonesia and suggests the ages and paleoenvironments of their source rocks. Geologists have speculated for many years that crude oils in eastern Indonesia originated mainly from Jurassic source rocks.
- Petersen, H. I.; Andsbjerg, J.; Bojesen-Koefoed, J. A.; Nytoft, H. P. **Coal-generated oil: source rock evaluation and petroleum geochemistry of the Lulita oilfield, Danish North Sea.** *Journal of Petroleum Geology*. 2000; 23 (1):55-90. ISSN: 0141-6421. Two coal-sourced fields, the *Harald* and *Lulita* fields, Danish North Sea were examined, for their excellent coal-sourced petroleum accumulations. There is still debate over whether coals can provide sources for commercial accumulations of oil. A compositional study of the coal seams at well *Lulita-1Xc* was undertaken to investigate the generation of liquid petroleum. Further studies are being conducted to investigate why the *Lulita* field, in contrast to the *Harald* field, is oil-dominated. Researchers are trying to understand why the coals are expelling oil, in order to establish an oil-source rock correlation.

- Phillips, C.; Evans, J.; Hom, W.; Clayton, J. **Long-term changes in sediment barium inventories associated with drilling-related discharges in the Santa Maria Basin, California, USA.** *Environmental Toxicology and Chemistry*. September 1998; 17 (9):1653-1661. ISSN: 0730-7268.
A nine-year examination of barium concentrations in suspended and surficial sediments near offshore oil platforms showed significant increases over time. Sediment samples within 500 m of the platforms contained residual BA concentrations up to a full order of magnitude above background samples.
- Phillips, C.; Clayton, J.; Evans, J.; Hom, W. **Evidence for long-range transport of a low to medium molecular-weight petroleum product off central California, USA.** *Environmental Toxicology and Chemistry*. September 1998; 17 (9):1662-1672. ISSN: 0730-7268.
The study showed that diluents, a petroleum product, released from an oil field in Guadalupe was found 50 km south of the release site in the Santa Maria Basin with relatively minimal degradation.
- Pinto, Linda J.; Moore, Margo M. **Release of polycyclic aromatic hydrocarbons from contaminated soils by surfactant and remediation of this effluent by *Penicillium* spp.** *Environmental Toxicology and Chemistry*. 2000; 19 (7):1741-1748. ISSN: 0730-7268.
A nonionic detergent, Tween 80, was used to determine its solubilization of ¹⁴C-PAH with aged PAH- from four different PAH-contaminated soils. Remediation of this effluent was achieved by adding an indigenous microorganism, *Penicillium* spp.
- Poletti, L.; Poletti, A.; Proietti, G.; Ludovisi, A. **Explorative statistical analysis of PAH pollution in some compartments of Lake Trasimeno.** *Annali di Chimica*. November-December 1997; 87 (11/12):777-788. ISSN: 0003-4592.
- Poroshin, V. D. **Chemical composition of formation waters from Paleozoic and Triassic deposits of the Algerian Sahara in connection with the assessment of their petroleum potential.** *Geokhimiya*. 1999; 7:734-741. ISSN: 0016-7525.
- Poster, D. L.; et al. **Certification of a diesel particulate related Standard Reference Material (SRM 1975) for PAHs.** *Polycyclic Aromatic Compounds*. 1999; 14:23-31. ISSN: 1040-6638.
- Raber, B.; Kogelknabner, I. **Influence of origin and properties of dissolved organic matter on the partition of polycyclic aromatic hydrocarbons (PAHs).** *European Journal of Soil Science*. September 1997; 48 (3):443-455. ISSN: 1351-0754.
- Radwan, S. S.; Al-Hasan, R. H.; Al-Awadhi, H.; Salamah, S.; Abdullah, H. M. **Higher oil biodegradation potential at the Arabian Gulf coast than in the water body.** *Marine Biology*. 2000; 135 (4):741-745. ISSN: 0025-3162.
Oil-utilizing microorganisms associated with animate and inanimate materials were compared with planktonic microorganisms in adjacent waters near Kuwait City. The potential for oil biodegradation has a much higher rate inshore than offshore waters. This paper validates the use of bioremediation technologies for oil-polluted marine habitats at the coast, rather than in the water body.
- Radwan, S. S.; Sorkhoh, N. A.; ElNemr, I. M.; ElDesouky, A.F. **A feasibility study on seeding as a bioremediation practice for the oily Kuwaiti desert.** *Journal of Applied Microbiology*. September 1997; 83 (3):353-358. ISSN: 1364-5072.
Numbers of an indigenous, oil-degrading *Arthrobacter* strain, KCC 201, greatly increased after the Kuwaiti oil spill event. Seeding with oil-degrading isolates did not increase degradation, and it resulted in dramatic decreases in KCC 201 numbers. Microbial competition is suspected.
- Raghavan, P. U. M.; Vivekanandan, M. **Bioremediation of oil-spilled sites through seeding of naturally adapted *Pseudomonas putida*.** *International Biodeterioration & Biodegradation*. 1999; 44 (1):29-32. ISSN: 0964-8305.
Naturally, adapted *Pseudomonas putida* isolated from an oil-contaminated site in Tiruchirappalli, India, was used to evaluate the biodegradation of crude oil in the open environment. Replicate field trials comprising oil, oil plus fertilizer, and oil plus bacteria were monitored for total viable count and rate of degradation of crude oil. The result from this research presents the successful bioremediation of oil in the open environment by the naturally adapted microbe.
- Ramon, J. C.; Dzou, L. I. **Petroleum geochemistry of Middle Magdalena Valley, Colombia.** *Organic Geochemistry*. 1999; 30 (4):249-266. ISSN: 0146-6380.
The organic geochemistry of 25 crude oil samples from reservoirs in the Middle Magdalena Valley, Columbia is used to infer the nature and/or features of crude oil source and rock depositional environments and to deduce hydrocarbon generation, migration and alteration history.

- Rebhun, M.; Meir, S.; Laor, Y. **Using dissolved humic acid to remove hydrophobic contaminants from water by complexation-flocculation process.** *Environmental Science & Technology*. April 1, 1998; 32 (7):981-986. ISSN: 0013-936X.
DHA was added to water and allowed to bind with the dissolved contaminants, and then a flocculent was added. The process proved effective at removing micropollutants of medium to high hydrophobicity.
- Reilly, T. J. **The use of mesocosms in marine oil spill-ecological research and development.** *Pure and Applied Chemistry*. 1999; 71 (1):153-160. ISSN: 0033-4545.
- Riser-Roberts, Eve. *Remediation of petroleum contaminated soils: biological, physical and chemical processes.* Boca Raton, Florida: Lewis Publishers; 1998; 576 pp.; ISBN: 0-87371-858-5.
This book focuses on the most commonly occurring contaminants: oils, gasoline, jet fuels and related petroleum products. It provides an outline for research, design, monitoring, and management of on-site treatment programs, as well as methods that can be tailored to specific conditions and constraints.
- Rockne, K. J.; Chee-Sanford, J. C.; Sanford, R. A.; Hedlund, B. P.; Staley, J. T. **Anaerobic naphthalene degradation by microbial pure cultures under nitrate-reducing conditions.** *Applied and Environmental Microbiology*. 2000; 66 (4):1595-1601. ISSN: 0099-2240.
Three naphthalene-degrading pure cultures were obtained, and tested positive for denitrification using a standard denitrification assay. Nitrate-limited cultures demonstrated that nitrate was required for degradation of naphthalene by NAP-3-1 and NAP-4. Results clearly demonstrate that highly enriched cultures can degrade unsubstituted aromatic compounds such as naphthalene without oxygen. This study is the first to present evidence of pure cultures capable of nitrate-dependent, anaerobic naphthalene degradation and mineralization.
- Rockne, Karl J.; Strand, Stuart E. **Biodegradation of bicyclic and polycyclic aromatic hydrocarbons in anaerobic enrichments.** *Environmental Science and Technology*. 1998; 32 (24):3962-3967. ISSN: 0013-936X.
Fluidized bed bioreactors are used to enrich for bacterial cultures able to anaerobically degrade naphthalene, biphenyl, and phenanthrene with stoichiometric production of sulfide or nitrate reduction.
- Roose, P.; Brinkman, U. A. T. **Determination of volatile organic compounds in marine biota.** *Journal of Chromatography A*. March 13, 1998; 799 (1/2):233-248. ISSN: 0021-9673.
- Rowland, A. P.; et al. **Effects of beach sand properties, temperature and rainfall on the degradation rates of oil in buried oil/beach sand mixtures.** *Environmental Pollution*. 2000; 109 (1):109-118. ISSN: 0141-5492.
- Roy, J. L.; McGill, W. B. **Characterization of disaggregated nonwetable surface soils found at old crude oil spill sites.** *Canadian Journal of Soil Science*. May 1998; 78 (2):331-344. ISSN: 0008-4271.
Soils at old crude oil spill sites are characterized by a strong resistance to wetting, a smaller population of microorganisms, slightly lower clay content, and small dry aggregates and reduced ability to support plant growth.
- Saeed, T.; Al-Hashash, H.; Al-Matrouk, K. **Assessment of the changes in the chemical composition of the crude oil spilled in the Kuwait desert after weathering for five years.** *Environment International*. January-February 1998; 24 (1/2):141-152. ISSN: 0160-4120.
- Salicis, F.; et al. **Biodegradation of fluoranthene by soil fungi.** *Chemosphere*. 1999; 38 (13):3031-3039. ISSN: 0045-6535.
Thirty-nine strains of micromycetes were tested for growth toxicity by fluoroanthene and then the ability to degrade or absorb fluoroanthene was determined.
- Sangjin, K., et al. **The effects of bioremediation in the oil degradation in oil polluted environments.** *New Developments in Marine Biotechnology*. 1998; 181-188. ISSN: 0-306-45907-8.
- Santas, Regas.; Santas, Photeinos. **Effects of wave action on the bioremediation of crude oil saturated hydrocarbons.** *Marine Pollution Bulletin*. 2000; 40 (5):434-439. ISSN: 0025-326X.
Two mesocosm tanks, simulating a typical Mediterranean shore, were set up as an experiment to investigate the effects of wave action on the biodegradation of Iranian Light Crude, with the addition of two different fertilizers.
- Santas, Regas; Hader, Donat-P.; Santas, Photeinos. **Is crude oil bioremediation affected by changes in ambient ultraviolet radiation?** *Marine Pollution Bulletin*. 1999; 38 (11):1022-1025. ISSN: 0025-326X.
A mesocosm experiment was set up to simulate a typical Mediterranean shore in winter and spring, and to investigate biodegradation of Iranian Light crude oil using an oleophilic fertilizer (F1); and to determine its effects too the exposure of ambient ultraviolet radiation.

- Sasaki, Tetsuya; Maki, Hideaki; Ishihara, Masami; Harayama, Shibeaki. **Vanadium as an internal marker to evaluate microbial degradation of crude oil.** *Environmental Science and Technology*. 1998; 32 (22):3618-3621. ISSN: 0013-936X.
Vanadium was compared with 17 β , 21 β -Hopane as a substitute internal marker for evaluating the biodegradation and weathering of crude oil.
- Sato, S.; Matsumura, A.; Urushigawa, Y., et al. **Type analysis and mutagenicity of petroleum oil extracted from sediment and soil samples in Kuwait.** *Environment International*. January-February;1998; 24 (1/2):67-76. ISSN: 0160-4120.
- Sato, S., et al. **Structural analysis of weathered oil from Kuwait's environment.** *Environment International*. January-February 1998; 24 (1/2):77-87. ISSN: 0160-4120.
- Sauer, T. C.; Michel, M. O.; Hayes and Aurand, D. V. **Hydrocarbon characterization and weathering of oiled intertidal sediments along the Saudi Arabian coast two years after the Gulf War oil spill.** *Environment International*. January-February;1998; 24 (1/2):43-60. ISSN: 0160-4120.
- Schindler, D. R.; Rios, A.; Valcarcel, M.; Grasserbauer, M. **Simple and rapid screening of total aromatic hydrocarbons in polluted water samples by the flow reversal liquid-liquid extraction technique.** *International Journal of Environmental Analytical Chemistry*. 1997; 66 (4):285-297. ISSN: 0306-7319.
- Seburn, D. C.; Kershaw, G. P. **Changes in the active layer of a subarctic right-of-way as a result of a crude-oil spill.** *Canadian Journal of Earth Sciences*. December 1997; 34 (12):1539-1544. ISSN: 0008-4077.
- Sekoulov, I.; Brinke-Seiferth, S. **Application of biofiltration in the crude oil processing industry.** *Water Science and Technology*. 1999; 39 (8):71-76. ISSN: 0273-1223.
- Sepic, E.; Bricelj, M.; Leskovsek, H. **Biodegradation studies of polyaromatic hydrocarbons in aqueous media.** *Journal of Applied Microbiology*. November 1997; 83 (5):561-568. ISSN: 1364-5072.
Mycobacterium ssp. PYR-1 and sixteen bacterial strains from an activated sludge were tested for their PAH degradability. The PAH degradation metabolic pathway was studied using fluoranthene and the bacterial strain AM.
- Setti, L.; Mazzieri, S.; Pifferi, P. G. **Enhanced degradation of heavy oil in an aqueous system by a *Pseudomonas* sp. in the presence of natural and synthetic sorbents.** *Bioresource Technology*. February 1999; 67 (2):191-199. ISSN: 0960-8524.
- Shen, L.; Jaffe, R. **Interactions between dissolved petroleum hydrocarbons and pure and humic acid-coated mineral surfaces in artificial seawater.** *Marine Environmental Research*. 2000; 49 (3):217-231. ISSN: 0414-1136.
The adsorption abilities of montmorillonite, alumina and kaolinite, in both pure and humic acid-modified form, were tested in a mixture of the water-soluble fraction of Fuel Oil No.6 and artificial seawater. Pseudo-equilibrium conditions were reached in 30 minutes. Humic acid-modified minerals enhanced the adsorption/partitioning of TPH and PAHs, when compared to the results from 'pure' clays.
- Short, J. W.; Bruce, A. W. **Repose to comment on "Natural hydrocarbon background in benthic sediments of Prince William Sound, Alaska: oil vs. coal".** *Environmental Science & Technology*. 2000; 34 (10):2066-2067. ISSN: 0013-936X.
Authors updating ongoing research activities in Prince William Sound, announce that coal particles have been discovered in sediments of the Gulf of Alaska, and contribute substantially to the sedimentary PAH burden.
- Shriadah, M. M. A. **Petroleum hydrocarbons along the Arabian Gulf coast of United Arab Emirates.** *Indian Journal of Marine Sciences*. 28 (1):10-16. ISSN: 0379-5136.
Sediment samples, surface and bottom seawater samples were collected monthly during 1993-1994 at 24 stations along the Arabian Gulf coast of United Arab Emirates. Results of procedures to determine concentration levels of oil pollution are indicated.
- Simon, M. A.; Bonner, J. S.; McDonald, T. J.; Autenrieth, R. L. **Bioaugmentation for the enhanced bioremediation of petroleum in a wetland.** *Polycyclic Aromatic Compounds*. 1999; 14:231-239. ISSN: 1040-6638.
- Skaarup, N.; Chalmers, J. A.; White, D. **An AVO study of a possible new hydrocarbon play, offshore central West Greenland.** *AAPG Bulletin - American Association of Petroleum Geologists*. 2000; 84 (2):174-182. ISSN: 0149-1423.
Extensive oil seeps have been discovered in Cretaceous sediment and Paleogene basalt in central West Greenland since 1992. Analyses of the oils show that they come from at least five source rocks that are probably situated near the seeps. These source rocks suggest the presence of hydrocarbons that migrated through basalts from deeper source rocks and then were trapped in overlying sediments above the basalts.

- Smith, V. H.; Graham, D. W.; Cleland, D. D. **Application of resource-ratio theory to hydrocarbon biodegradation.** *Environmental Science & Technology*. November 1, 1998; 32 (21):3386-3395. ISSN: 0013-936X.
Resource-ratio theory predicts that changes in nitrogen and phosphorus supply ratio conditions will alter biodegradation rates and that changes in absolute nutrient supply levels will alter total hydrocarbon-degrader biomass. The researchers found that hydrocarbon degradation in slurry reactors was consistent with the theory, and it is suspected that degradation of marine oil spills would also be consistent with the resource ratio theory.
- Soclo, H. H.; Garrigues, P. H.; Ewald, M. **Origin of polycyclic aromatic hydrocarbons (PAHs) in coastal marine sediments: case studies in Cotonou (Benin) and Aquitaine (France) areas.** *Marine Pollution Bulletin*. 2000; 40 (5):387-396. ISSN: 0025-326X.
Sediments from Cotonou and Aquitaine coastal zones were studied, and found to contain several types of PAHs. Sediment analysis from the Cotonou lagoon discovered petrogenic PAHs, due to petroleum trade at individual scale along the lagoon, as well as waste oils from machine shops. Pyrolytic PAHs were found in sediments from Aquitaine. Petroleum product deliveries and fuel combustion emissions account for the presence of PAHs, which occurred while boats were docked in the harbors of both areas. Discovery of perylene, especially at Cotonou, gave rise to speculation of its origin.
- Sohrabi, M.; Mogharei, A.; Ghasemi, N. **Some aspects of bioremediation of soil contaminated with petroleum hydrocarbons.** *Afinidad*. 1999; 56 (483):307-312. ISSN: 0001-9704.
- Speidel, H. K.; Lightner, R. L.; Ahmed, I. **Biodegradability of new engineered fuels compared to conventional petroleum fuels and alternative fuels in current use.** *Applied Biochemistry and Biotechnology*. 2000; 84 (6):879-897. ISSN: 0273-2289.
- Stange, Kari; Klungsøyr, J. **Organochlorine contaminants in fish and polycyclic aromatic hydrocarbons in sediments from the Barents Sea.** *ICES Journal of Marine Science*. 1997; 54 (3):318-332. ISSN: 1054-3139.
The paper describes the distribution of certain aromatic hydrocarbons found in sediment samples from 140 Barents Sea locations.
- Stefess, G. C. **Monitoring of environmental effects and process performance during biological treatment of sediment from the petroleum harbor in Amsterdam.** *Water Science and Technology*. 1998; 37 (6/7):395-402. ISSN: 0273-1223.
- Sugimoto, I.; Nakamura, M.; Ogawa, S.; Seyama, M.; Katoh, T. **Petroleum pollution sensing at ppb level using quartz crystal resonators sputtered with porous polyethylene under photo-excitation.** *Sensors and Actuators B - Chemical*. 2000; 64 (1/3):216-223. ISSN: 0925-4005.
A new method of detecting petroleum hydrocarbon vapors at low ppb levels is discussed. Results of experiments testing the capabilities of the sensor are included.
- Swannell, R., et al. **A field demonstration of the efficacy of bioremediation to treat oiled shorelines following the *Sea Empress* incident.** *Environmental Technology*. 1999; 20 (8):863-873. ISSN: 0959-3330.
The grounding of the *Sea Empress* in 1996, stranded a mixture of cargo oil (Forties Blend) and heavy fuel oil onto the shoreline of Bullwell Bay, Milford Haven, Uk. Two bioremediation treatments: a weekly application, consisting of single application of a slow-release fertilizer and mineral nutrients dissolved in seawater was investigated for their bioremediation effects. Results clearly show that the addition of both liquid inorganic and slow-release mineral fertilizer were capable of significantly stimulating the biodegradation of the oil mixture.
- Taylor, C.; Viraraghavan, T. **A bench-scale investigation of land treatment of soil contaminated with diesel fuel.** *Chemosphere*. 1999; 39 (10):1583-1593. ISSN: 0045-6535.
Over a 17-week testing period, a bench-scale investigation was conducted on degradation rates of diesel-contaminated soil under different treatment conditions. Biodegradation success rates were obtained at maximum by the addition of nutrients to the diesel contaminated soil.
- Thomann, R. V.; Komlos, J. **Model of biota-sediment accumulation factor for polycyclic aromatic hydrocarbons.** *Environmental Toxicology and Chemistry*. 1999; 18 (5):1060-1068. ISSN: 0730-7268.
- Thomas, S. D.; Li, Q. X. **Immunoaffinity chromatography for analysis of polycyclic aromatic hydrocarbons in corals.** *Environmental Science & Technology*. 2000; 34 (12):2649-2654. ISSN: 0013-936X.
An immunoaffinity chromatographic method is developed for the quantitative cleanup of supercritical CO₂ extracts of coral for the analysis of PAHs.

- Thouand, G.; et al. **Laboratory evaluation of crude oil biodegradation with commercial or natural microbial inocula.** *Canadian Journal of Microbiology.* 1999; 45 (2):106-115. ISSN: 0008-4166.
Natural and commercial inocula are compared for their effectiveness in biodegradation of crude oil. Results of laboratory experiments using inocula are evaluated and presented in the paper.
- Tian, G. L.; Lei, Q. H.; Lui, W. D.; Li, F. **Colloid chemistry in petroleum industry in China.** *Journal of Dispersion Science and Technology.* 2000; 21 (4):433-448. ISSN: 0193-2691.
- Tiehm, A.; Stieber, M.; Werner, P.; Frimmel, F. H. **Surfactant-enhanced mobilization and biodegradation of polycyclic aromatic hydrocarbons in manufactured gas plant soil.** *Environmental Science & Technology.* September 1997; 31 (9):2570-2576. ISSN: 0013-936X.
To counteract the limitations of bioremediation of contaminated soil due to low bioavailability of the contaminants, gas plant soil treated with two nonionic surfactants was tested in soil columns percolated by recirculating flushing water.
- Tran, T. D.; Derwin, D. J.; Zaleski, P.; Song, X.; Kinoshita, K. **Lithium intercalation studies of petroleum cokes of different morphologies.** *Journal of Power Sources.* 1999; 82:296-299. ISSN: 0378-7753.
- Traulsen, F.; Andersson, J. T.; Ehrhardt, M. G. **Acidic and non-acidic products from the photo-oxidation of the crude oil component dibenzothiophene dissolved in seawater.** *Analytica Chimica Acta.* 1999; 392 (1):19-28. ISSN: 0003-2670.
Photo-oxidation of dibenzothiophene in seawater under natural sunlight appears to be a major removal process for this crude oil component under marine environmental conditions. A combination of using SPE and HPLC in the ion-pair mode along with GC-MS analysis proved very effective for the extraction procedure of carboxylic acids and seems to be a promising new way for the analysis of acids from natural seawater environments. This result supports the view that the isolation and identification of acidic products is essential to gaining profound knowledge about environmental degradation processes.
- Utvik, T. I. R. **Chemical characterization of produced water from four offshore oil production platforms in the North Sea.** *Chemosphere.* 1999; 39 (15):2593-2606. ISSN: 0045-6535.
- van Balen, R. T.; et al. **Modelling the hydrocarbon generation and migration in the West Netherlands Basin, the Netherlands.** *Netherlands Journal of Geosciences.* 2000; 79 (1):29-44. ISSN: 0016-7746.
The objective of this study is to increase the understanding of the evolution of hydrocarbon accumulations in terms of timing of hydrocarbon generation and migration, in relation to the tectonic evolution of the basin.
- van Hamme, J. D.; Odumeru, J. A.; Ward, O. P. **Community dynamics of a mixed-bacterial culture growing on petroleum hydrocarbons in batch culture.** *Canadian Journal of Microbiology.* 2000; 46 (5):441-450. ISSN: 0008-4166.
Mixed-bacterial cultures were exposed to various hydrocarbon substrates to examine community structure and the dynamics of the cultures involved in treatment.
- van Hamme, J. D.; Ward, O. P. **Influence of chemical surfactants on the biodegradation of crude oil by a mixed bacterial culture.** *Canadian Journal of Microbiology.* 1999; 45 (2):130-137. ISSN: 0008-4166.
Chemical surfactants have the potential to improve the microbiological methods used to remediate crude oil contaminated wastes. Factors such as molecular structure, hydrophile-lipophile balance (HLB), and surfactant concentrations should be considered when applied to microbial systems.
- Wang, Z. D.; Fingas, M.; Page, D. S. **Oil spill identification.** *Journal of Chromatography A.* 1999; 843 (1/2):369-411. ISSN: 0021-9673.
This article reviews the most recent development and advances of chemical fingerprinting and data interpretation techniques, which are most frequently used in oil, spill identification studies. The article also addresses the issue of how biogenic and pyrogenic hydrocarbons are distinguished from petrogenic hydrocarbons. An example from the *Exxon Valdez* oil spill is also reviewed in this paper to illustrate how complex hydrocarbon mixtures were identified and allocated to multiple sources by using advanced chemical fingerprinting techniques.
- Wang, Z. D., et al. **Source identification of unknown spilled oil from Quebec (1998) by unique biomarkers and diagnostic ratios of "source-specific marker" compounds.** *Environmental Technology.* 1999; 20 (8):851-862. ISSN: 0959-3330.
A detailed analytical approach using unique biomarkers and diagnostic ratios of 'source-specific marker' compounds for spill source identification and characterization of chemical compositions are described in this study.

- Wang, Z. D., et al. **Comparison of oil composition changes due to biodegradation and physical weathering in different oils.** *Journal of Chromatography A*. June 5, 1998; 809 (1/2):89-107. ISSN: 0021-9673.
The study determined that biodegradation produces distinct oil composition changes that are very different from physical weathering patterns. Biodegradation potential indices for various oils were calculated using equations proposed by Environment Canada, and the US National Oceanic and Atmospheric Administration.
- Warton, B.; Alexander, R.; Kagi, R. I. **Characterization of the ruthenium tetroxide oxidation products from the aromatic unresolved complex mixture of a biodegraded crude oil.** *Organic Geochemistry*. 2000; 31 (2/3):249. ISSN: 0146-6380.
- Waseda, A.; Nishita, H. **Geochemical characteristics of terrigenous- and marine-sourced oils in Hokkaido, Japan.** *Organic Geochemistry*. 1998; 28 (1/2):27-41. ISSN: 0146-6380.
Using bulk properties, carbon-isotope compositions and biomarker distributions, crude oils in Hokkaido, Japan can be easily typed into two source categories. The marine oils are found in areas of high volcanic activity heat flow, or where the Neogene and Quaternary sediments are thick.
- Weimer, P.; Crews, J. R.; Crow, R. S.; Varnai, P. **Atlas of petroleum fields and discoveries, northern Green Canyon, Ewing Bank, and southern Ship Shoal and South Timbalier areas (offshore Louisiana), northern Gulf of Mexico.** *AAPG Bulletin - American Association of Petroleum Geologists*. May 1998; 82 (5 Part B):878-917. ISSN: 0149-1423.
Seismic profiles, wireline logs, and production characteristic summaries are given for 35 fields in offshore Louisiana.
- Weise, A. M.; Nalewajko, C.; Lee, K. **Oil-mineral fine interactions facilitate oil biodegradation in seawater.** *Environmental Technology*. 1999; 20 (8):811-824. ISSN: 0959-3330.
This study was conducted by Shaker Flask experiments under simulated environmental conditions. This method was used to measure the significance of the intrinsic oil spill remediation process for coastal environments, and provide direct evidence of enhanced bacterial activity and oil degradation rates in micro-aggregate structures formed by oil-mineral interactions.
- Wheelock, C. E.; et al. **Hsp60-induced tolerance in the rotifer *Brachionus plicatilis* exposed to multiple environmental contaminants.** *Archives of Environmental Contamination and Toxicology*. 1999; 36:281-287. ISSN: 0090-4341.
Results of this study suggest that induction of hsp60 by chronic low-level exposure may serve as a protective mechanism against subsequent or multiple stressors and that hsp60 level are not additive for the toxicants tested in this study, giving no dose-response relationship.
- White, P. A.; Rasmussen, J. B.; Blaise, C. **Genotoxic substances in the St. Lawrence system 1: Industrial genotoxins sorbed to particulate matter in the St. Lawrence, St. Maurice, and Saguenay Rivers, Canada.** *Environmental Toxicology and Chemistry*. February 1998; 17 (2):286-303. ISSN: 0730-7268.
- Whyte, L. G.; Bourbonniere, L.; Greer, C. W. **Biodegradation of petroleum hydrocarbons by psychrotrophic pseudomonas strains possessing both alkane (alk) and naphthalene (nah) catabolic pathways.** *Applied and Environmental Microbiology*. September 1997; 63 (9):3719-3723. ISSN: 0099-2240.
- Wilkes, H.; Boreham, C.; Harms, G.; Zengler, K.; Rabus, R. **Anaerobic degradation and carbon isotopic fractionation of alkylbenzenes in crude oil by sulphate-reducing bacteria.** *Organic Geochemistry*. 2000; 31 (1):101-115. ISSN: 0146-6380.
In a laboratory experiment alkylbenzenes were selectively removed from crude oil taken from a North Sea oil tank by enriched sulphate-reducing bacteria during growth. Alkylated benzoic acids may be used as a specific indicator of initial biodegradation of crude oils and fossil fuels in various environments.
- Williams, C. M.; Grimes, J. L.; Mikkelsen, R. L. **The use of poultry litter as Co-substrate and source of inorganic nutrients and microorganisms for the *ex situ* biodegradation of petroleum compounds.** *Poultry Science*. 1999; 78 (7):956-964. ISSN: 0032-5791.
A laboratory-scale experiment was conducted to investigate and determine the feasibility of utilizing poultry litter as a source of microorganisms, co-substrate, nitrogen and phosphorus to enhance the biodegradation of petroleum compounds in contaminated soil. Results demonstrate that bioremediation of soil contaminated with petroleum compounds was significantly enhanced when supplemented with poultry litter in concentrations of 10% soil volume.

- Winkels, H. J., et al. **Geochronology of priority pollutants in sedimentation zones of the Volga and Danube delta in comparison with the Rhine delta.** *Applied Geochemistry*. July 1998; 13 (5):581-591. ISSN: 0883-2927.
Five decades of sediment core data were compared to determine trends in pollution concentration in the deltas of the Volga, Danube and Rhine rivers. The Rhine sediments have remained the most polluted.
- Wischmann, H.; Steinhart, H. **The formation of PAH oxidation products in soils and soil/compost mixtures.** *Chemosphere*. October 1997; 35 (8):1681-1698. ISSN: 0045-6535.
- Wrenn, Brian A., et al. **Influence of tide and waves on washout of dissolved nutrients from the bioremediation zone of a coarse-sand beach: application in oil-spill bioremediation.** *Spill Science & Technology Bulletin*. 1997; 4 (2):89-98. ISSN: 1353-2561.
A conservative tracer (LiNO₃) was applied to a beach surface during full-moon spring tides and during neap tides. The tracer was gone from the beach in one day during the times of spring tide application, but it remained for several days during times of neap tide application.
- Xie, G. B.; Barcelona, M. J.; Fang, J. S. **Quantification and interpretation of total petroleum hydrocarbons in sediment samples by a GC/MS method and comparison with EPA 418.1 and a rapid field method.** *Analytical Chemistry*. 1999; 71 (9):1899-1904. ISSN: 0003-2700.
This paper presents three currently used methods (GC/MS, conventional EPA 418.1, and a rapid field method PetroFLAG) performed to quantify, standardize and improve the comparability of total petroleum hydrocarbon (TPH) data in sediment samples.
- Yamanaka, T.; Mizota, C.; Murae, T.; Hashimoto, J. **Currently forming petroleum associated with hydrothermal mineralization in a submarine caldera, Kagoshima Bay, Japan.** *Geochemical Journal*. 1999; 33 (6):355-367. ISSN: 0016-7002.
- Yang, G. P.; Zhang, Z. B. **Adsorption of dibenzothiophene on marine sediments treated by a sequential procedure.** *Journal of Colloid and Interface Science*. August 15, 1997; 192 (2):398-407. ISSN: 0021-9797.
Sorption isotherms for dibenzothiophene on both no treatment and treated sediments were linear. Nonlinear adsorption isotherms of dibenzothiophene were observed on sediments treated with H₂O₂.
- Yang, Y.; Miller, D. J.; Hawthorne, S. B. **Solid-phase microextraction of polychlorinated biphenyls.** *Journal of Chromatography A*. March 27, 1998; 800 (2):257-266. ISSN: 0021-9673.
- Yilmaz, K., et al. **Polynuclear aromatic hydrocarbons (PAHs) in the eastern Mediterranean Sea.** *Marine Pollution Bulletin*. 1998; 36 (11):922-925. ISSN: 0025-326X.
In the Mediterranean Sea, surface waters do not show high levels of pollution, but the PAH pollution in the sediments has increased over the 10 years examined.
- Yin, X. C.; Zhang, L. M.; Li, Z. M. **Studies on new ampholytic cellulose derivative as clay-hydration inhibitor in oil field drilling fluid.** *Journal of Applied Polymer Science*. October 31, 1998; 70 (5):921-926. ISSN: 0021-8995.
Acrylamide and dimethyldiallylammonium chloride were grafted onto carboxymethyl cellulose to produce a new ampholytic cellulose derivative for use in drilling. This ampholytic cellulose derivative has a hydration inhibitive property.
- Yuste, L.; et al. **Characterization of bacterial strains able to grow on high molecular mass residues from crude oil processing.** *FEMS Microbiology Ecology*. 2000; 32 (1):69-75. ISSN: 0168-6496.
Soil was contaminated with a number of high molecular mass compounds, including PAHs, to determine if bacteria could degrade the compounds. Seven bacterial strains were identified as being capable of degrading long-chain-length alkanes, but not PAHs. Some strains however, were able to degrade pure naphthalene, when the naphthalene was the sole source of carbon and energy.
- Zakaria, M. P.; et al. **Oil pollution in the Straits of Malacca, Malaysia: Application of molecular markers for source identification.** *Environmental Science & Technology*. 2000; 34 (7):1189-1196. ISSN: 0013-936X.
This paper examines the utility of triterpanes as a biomarker compound, to identify the source of oil spills in the Straits of Malacca. Middle East crude oils, South East Asian crude oils, tarballs, sediments, and mussels were analyzed to determine the exact source of the spills.
- Zanardi, E.; Bicego, M. C.; Weber, R. R. **Dissolved/dispersed petroleum aromatic hydrocarbons in the Sao Sebastiao Channel, Sao Paulo, Brazil.** *Marine Pollution Bulletin*. 1999; 38 (5):410-413.
A monitoring program at Sao Sebastiao Channel, Sao Paulo, Brazil, was conducted in terms of dissolved/dispersed petroleum aromatic hydrocarbons (DDPAH) in water analyzed by fluorescence spectroscopy. The study was conducted to establish a baseline data for the area and verify the petroleum hydrocarbon influence from the oil terminal and other human activities over the channel.

- Zanardi, E.; et al. **Distribution and origin of hydrocarbons in water and sediment in Sao Sebastiao, SP, Brazil.** *Marine Pollution Bulletin*. 1999; 38 (4):261-267. ISSN: 0025-326X.
Dissolved/dispersed petroleum hydrocarbons (DDPH) found in surface water and bottom sediments samples taken from the Sao Sebastiao Channel were influenced by anthropogenic activities.
- Zhang, Y. M.; Maier, W. J.; Miller, R. M. **Effect of rhamnolipids on the dissolution, bioavailability and biodegradation of phenanthrene.** *Environmental Science & Technology*. August 1997; 31 (8):2211-2217. ISSN: 0013-936X.
A monorhamnolipid and a dirhamnolipid surfactant were tested, and both were found to increase the solubility and enhance the rate of Phenanthrene biodegradation.
- Zinjarde, S. S.; Pant, A.; Deshpande, M. V. **Dimorphic transition in *Yarrowia lipolytica* isolated from oil-polluted sea water.** *Mycological Research*. May 1998; 102 (Part 5):553-558. ISSN: 0953-7562.
The yeast form of *Y. lipolytica* degraded the aliphatic fraction of crude oil and alkanes under aerobic conditions.
- Zylstra, G. J.; Kim, E. **Aromatic hydrocarbon degradation by *Sphingomonas yanoikuyae* B1.** *Journal of Industrial Microbiology & Biotechnology*. November-December 1997; 19 (5/6):408-414. ISSN: 0169-4146.

Albright, James N.; Dreesen, Donald S. **Microhole technology lowers reservoir exploration, characterization costs.** *Oil & Gas Journal*. 2000; 98 (2):39-41. ISSN: 0030-1388.

This article examines some of the rationale, benefits, and sources of cost reduction for the new development of technology to drill small-diameter boreholes with micro-instrumentation, for both exploration and instrumentation access.

Ali, Syed A.; Henry, L. R.; Darlington, J. W.; Occapinti, J. **New filtration process cuts contaminants from offshore produced water.** *Oil & Gas Journal*. November 2, 1998; 96 (44):73-78. ISSN: 0030-1388.

A two-part filtration process of Crudesorb technology and a polymeric resin has been shown to effectively reduce oil and grease in offshore-discharged water produced during offshore drilling.

Ali, Syed A., et al. **Offshore frac packs benefit from seawater-based borate fluid.** *Oil & Gas Journal*. Sept. 28, 1998; 96 (39):49-62. ISSN: 0030-1388.

Seawater-based frac fluids are replacing freshwater frac fluids in offshore drilling in high-permeability sands. Operators are installing more probes to monitor sand and erosion.

Allen, J. **Flow assurance-developing technology.** *Sea Technology*. 1999; 40 (4):25-31. ISSN: 0093-3651.

Deepwater offshore fields are being developed at increased stepout distances, which also create a challenge in cold-water environments. A new commercial fiber-optic temperature/pressure technique with new reservoir/well management methodology abets a flow-assurance procedure for deepwater production which is critical to the success and economic operations of the production system.

An, Chang-Fa; Brown, H. M.; Goodman, R. H.; Clavelle, Eric. **Animation of boom failure processes.** *Spill Science & Technology Bulletin*. 1996; 3 (4):221-224. ISSN: 1353-2561.

Images are obtained from a graphical output of numerical modelling using a computational fluid dynamics (CFD) program, Fluent, which is a useful tool for demonstrating oil-water flow around a boom and boom failure process.

Anderson, Roger N. **Oil production in the 21st century.** *Scientific American*. March 1998; 278 (3):86-91. ISSN: 0036-8733.

The article discusses four advances in locating and retrieving oil deposits: Tracking subterranean oil in 4-D, Injecting liquid carbon dioxide to raise oil levels, directional drilling with sensors and deep water drilling.

Barrau, J. **Profile indicator helps predict pipeline holdup, slugging.** *Oil & Gas Journal*. February 21, 2000; 98 (8):58-62. ISSN: 0030-1388.

The pipeline Profile Indicator (PI) constitutes an additional engineering tool to be used from conceptual design to operational studies of multiphase pipelines. This technology has been developed quantitatively to characterize pipelines based on the propensity of their profiles to induce liquid holdup.

Barsamian, Ara; Whitehead, Richard. **Statistical method used to estimate refining tankage.** *Oil & Gas Journal*. February 28, 2000; 98 (9):51-53. ISSN: 0030-1388.

By using a statistical risk simulator program, estimation of needed storage capacity results in significant savings in capital expenditures for building new tanks and lines. It also increases the throughput of an existing facility by maximizing the efficiency of its use.

Birkeland, Reidar; Lilleland, S. E.; Johnsen, R.; Braaten, N. A. **Erosion monitoring manages sand production.** *Oil & Gas Journal*. Sept. 28, 1998; 96 (39):64-71. ISSN: 0030-1388.

On-line sand monitoring systems can be mounted on subsea christmas trees and help reduce damage to processing equipment due to sand intake. On-line sand monitoring systems can establish optimum flow rates with regards to tolerable sand production during initial well testing.

Blomberg, E.; Claeson, C. M. **Oil spill clean-up technologies for rivers, ports and sheltered waters. Part I - hydrodynamic circus.** *Spill Science & Technology*. 1997; 4 (1):45-53. ISSN: 1353-2561.

The article describes the circus, an oil spill control and recovery device suitable for use in fast flowing rivers and mobile sweep operations. The circus can be used as a stationary system in currents up to 4 knots, and as a sweep system with jibs advancing at 3 knots.

Blondina, Gloria J., et al. **A modified swirling flask efficacy test for oil spill dispersants.** *Spill Science & Technology Bulletin*. 1997; 4 (3):177-185. ISSN: 1353-2561.

The state of California has modified the EPA's Swirling Flask Test procedure and implemented it as the standard method for evaluating dispersant effectiveness on petroleum products found in coastal waters. The modifications include the use of a closed test vessel, gas chromatography chemical analysis and correction for dispersant contribution.

- Bodenhamer, Kevin C.; Laguens, J. P. **New gulf pipeline begins feeds to Louisiana processing.** *Oil & Gas Journal*. Oct. 19, 1998; 96 (42):73-78. ISSN: 0030-1388.
The Discovery pipeline, ranking as the deepest 30-inch line in the gulf, brings wet gas from Gulf of Mexico producers' offshore Louisiana to processing and marketing onshore.
- Bouzige, M.; Pichon, V.; Hennion, M. C. **On-line coupling of immunosorbent and liquid chromatographic analysis for the selective extraction and determination of polycyclic aromatic hydrocarbons in water samples at the ng 1(-1) level.** *Journal of Chromatography A*. October 9, 1998; 823 (1/2):197-210. ISSN: 0021-9673.
An immunoaffinity chromatography method was developed for selective extraction of PAHs from water samples.
- Boyadjieff, George. **Computers, automation, and offsite personnel to operate tomorrow's rigs.** *Oil & Gas Journal*. 1999; 97 (50):46-58. ISSN: 0030-1388.
As computers, automation, and offsite personnel become more prevalent in the 21st century for the operations of oilrigs, predictions for traditional support by humans will become less common.
- Brandvik, P. J.; Daling, P. S. **Optimizing oil spill dispersants as a function of oil type and weathering degree: a multivariate approach using partial least squares (PLS).** *Chemometrics and Intelligent Laboratory Systems*. August 24, 1998; 42 (1/2 Sp. Iss.):73-91. ISSN: 0169-7439.
Characterization of oil type and weathering degree by principal component analysis was used in the partial least squares algorithm to predict optimized dispersant composition.
- Brandvik, P. J.; Daling, P. S. **Optimization of oil spill dispersant composition by mixture design and response surface methods.** *Chemometrics and Intelligent Laboratory Systems*. August 24, 1998; 42 (1/2 Sp. Iss.):63-72. ISSN: 0169-7439.
The combined use of mixture design and response surface methods was verified as an appropriate dispersant optimization technique.
- Brown, Carl E.; Nelson, Robert D.; Fingas, Mervin F. **Recovery of the Irving Whale Oil Barge: overflights with the laser environmental airborne fluorosensor.** *Spill Science & Technology Bulletin*. 1996; 3 (4):231-234. ISSN: 1353-2561.
Using the real-time laser environmental airborne fluorosensor to detect leaks during a barge recovery operation, radar operators were able to radio spill response personnel on the surface with the locations of the spills.
- Brown, Carl E., et al. **Laser fluorosensor overflights of the Santa Barbara oil seeps.** *Spill Science & Technology Bulletin*. 1996; 3 (4):227-230. ISSN: 1353-2561.
The laser environmental airborne fluorosensor (LEAF) is able to discriminate between non-fluorescing, biogenic oils produced by kelp and fluorescing petroleum oils.
- Brown, H. M.; Goodman, R. H.; An, Chang-Fa; Bittner, J. **Boom failure mechanisms: comparison of channel experiments with computer modelling results.** *Spill Science & Technology Bulletin*. 1996; 3 (4):217-220. ISSN: 1353-2561.
The computer simulated measurements of boom failure mechanisms compared very well with actual measurements taken from channel experiments.
- Bünting, U.; Karlitschek, P. **Mathematical model for optimum fiber optic probe design and characterization.** *Spectrochimica Acta Part A - Molecular and Biomolecular Spectroscopy*. September 1998; 54 (10):1369-1374. ISSN: 1386-1425.
A mathematical model for the optimization of a fiber optic probe is described and applied to an *in situ* fiber optic laser fluorometer for the detection of water pollution.
- Burns, R. F. **World's deepest water drilling/production platform.** *Sea Technology*. 1999; 40 (1):19-23. ISSN: 0093-3651.
Exxon and BP Amoco, in co-development of the Hoover/Diana fields in the western Gulf of Mexico, will set a record for the deepest drilling and production platform with an associated subsea development. The Hoover/Diana project advances deepwater technology in design and installation of pipelines, risers, and mooring systems.
- Bye, C. M.; Dold, P. L. **Evaluation of correlations for zone settling velocity parameters based on sludge volume index-type measures and consequences in settling tank design.** *Water Environment Research*. 1999; 71 (7):1333-1344. ISSN: 1061-4303.
- Cadei, J. *Composites for the Offshore Oil and Gas Industry - Design and Application.* MSP. Manunsell, Kent, UK: Professional Engineering Publishing Limited; 1999; 101 p. ISBN: 1-860-58229-X.
As offshore production installation evolved toward unmanned systems and deeper water fields, the consequential benefits of reduced weight and low maintenance are becoming more significant. This paper offers a brief overview of a method to design primary structures in composite materials for the offshore oil and gas industry.

Corbett, S.; Rayson, Martin. **Global positioning technologies provide essential exploration tool.** *Oil & Gas Journal*. 1999; 97 (26):54-58. ISSN: 0030-1388.

GPS satellite systems and derivatives provide the oil and gas industry with a host of applications that are essential to exploration and production. For the oil and gas industry the Differential Global Positioning System (DGPS) is primarily used for the horizontal positional precision capability, which is 95% accurate in positing a drilling rig.

Crawford, W. R., et al. **Current predictions for oil spill models.** *Spill Science & Technology Bulletin*. 1996; 3 (4):235-239. ISSN: 1353-2561.

The researchers developed and applied a background data set of surface currents and wind responses to be used with oil spill software programs.

Daidola, J. C.; Reyling, Christopher J.; Ameer, Paul G. **Oil outflow estimates for tankers and barges.** *Spill Science & Technology Bulletin*. 1997; 4 (2):89-98. ISSN: 1353-2561.

Pre-MARPOL, MARPOL '73, and MARPOL '73/'78 were the three baseline tanker types used in this experiment. Four tanker sizes, and various pollution control measures, were tested.

Davidson, B. M., et al. **Study offshore Trinidad determines frac-pack effectiveness.** *Oil & Gas Journal*. Sept. 7, 1998; 96 (36):100-110. ISSN: 0030-1388.

It was determined that frac-packing was not the cause of low yields from Trinidad's Soldado field.

Derkach, D. N.; Drutik, N. E. **High-torque gear reducer expands turbodrill capabilities.** *Oil & Gas Journal*. 1999; 97 (27):53-62. ISSN: 0030-1388.

New developments in turbodrill application aided by high-torque gear reducers, provide a reliable sealing system that can be upgraded to meet the requirements for modern drilling equipment and technological advances.

Development of a method for the evaluation of fire-resistant oil spill containment boom. *Journal of Research of the National Institute of Standards and Technology*. January-February 1998; 103 (1):122. ISSN: 1044-677X.

Researchers at the National Institute of Standards and Technology have designed a wave tank capable of evaluating the performance of 15 m sections of booms under fire during high waves. The tank can produce 0.3 m waves and has a 5 m fire diameter.

Dimov, N.; Pavlova, A. **Traceability from weathered oil spills in the marine environment to the original contamination source. A case study.** *Journal of Environmental Monitoring*. 2000; 2 (3):266-270. ISSN: 1464-0325.

Douligeris, C., et al. **Development of a national marine oil transportation system model.** *Spill Science & Technology Bulletin*. 1997; 4 (2):113-121. ISSN: 1353-2561.

This high-level strategic decision-making tool will be used to identify causes of oil spills and prioritize oil pollution.

Dynamic positioning, compact power system create new life for semi submersible. *Oil & Gas Journal*. Oct. 5, 1998; 96 (40):60-61. ISSN: 0030-1388.

Noble Drilling Corp. has a newly redesigned semi submersible, called the Paul Wolff. It is scheduled to depart from Port Sabine, TX this fall to the Campos basin in the South Atlantic.

Edwards, John, et al. **Geosteering techniques avoid production completions.** *Oil & Gas Journal*. 1999; 97 (47):43-48. ISSN: 0030-1388.

A combination of innovative geosteering techniques, aided by state-of-the-art logging-while-drilling (LWD) technologies, will provide an alternative method for collision avoidance with existing wellbores.

Eiber, Bob, et al. **Full-scale tests confirm pipe toughness for North American pipeline.** *Oil & Gas Journal*. 1999; 97 (45):48-54. ISSN: 0030-1388.

Full-scale burst tests performed on line pipe typical of pipe being installed on the Canadian-US Alliance project have validated fracture control for the pipeline system. Tests demonstrated that under typical worst-case operating conditions, fractures that occur would quickly arrest.

Elskens, Frank. **Environmental impacts on dredging technologies.** *Sea Technology*. 1999; 40 (9):53-58. ISSN: 0093-3651.

Pressure is on to ensure that the removal and disposal of all dredged material adheres to the strictest standards in environmental dredging. In recent years contractors have developed new tools for environmental dredging and handling of contaminated sediments from harbor bottom, and channels.

Engelhardt, F. R. **Remote sensing for oil spill detection and response.** *Pure and Applied Chemistry*. 1999; 71 (1):103-111. ISSN: 0033-4545.

Satellite remote sensing in spill response provides essential information to enhance strategic and tactical decision-making. Growing recognition for the use of aircraft remote sensing platforms to aid cleanup response efforts can mitigate the effects of oil on the environment, as well as reduce cleanup costs.

Eoff, L.; Griffith, J. **Acrylate monomer solution stops artesian water, geopressured sand flows.** *Oil & Gas Journal*. November 2, 1998; 96 (44):89-91. ISSN: 0030-1388.

The acrylate monomer solution is pumped into wells as a thin liquid, but it gels into an impermeable barrier effective in temperatures from 50 to 200° F.

Exxon sets drilling record. *Ocean News & Technology*. 2000; 6 (1):20. ISSN: 1082-6106.

Exxon has set a world record for extended-reach drilling at its Sacate Field, offshore California. The well reaches water depths greater than 700 feet, and is the longest extended reach documented in any depth in US offshore waters.

Fingas, M. F.; Brown, C. E. **Review of oil spill remote sensing.** *Spill Science & Technology Bulletin*. December 1997; 4 (4):199-208. ISSN: 1353-2561. Active and passive airborne and space-borne sensors are reviewed and evaluated according to their usefulness in responding to oil spills. Examples of recent developments are given.

Fingas, Merv.; Fieldhouse, Ben; Mullin, Joseph V. **Studies of water-in-oil emulsions: stability studies.** *Spill Science & Technology Bulletin*. 1996; 3 (4):189-190. ISSN: 1353-2561.

Emulsions made from crude oil and water has different stabilities based on asphalt content.

Fingas, Merv. **The evaporation of oil spills: prediction of equations using distillation data.** *Spill Science & Technology Bulletin*. 1996; 3 (4):191-192. ISSN: 1353-2561.

Of the 19 oils tested, diesel fuel, FCC Heavy Cycle and Bunker C light oils were the only three that did not follow logarithmic evaporation curves.

Gaaseidnes, K.; Turbeville, J. **Separation of oil and water in oil spill recovery operations.** *Pure and Applied Chemistry*. 1999; 71 (1):95-101. ISSN: 0033-4545. Separation of water from oil that is collected in any spill recovery operation and the effects of weathering and emulsion generation which increase the problems normally associated with water extraction, is addressed in this paper. Separation theory, practical separation technology and recommendations for the future direction of research and development are presented.

Gaddy, D. E. **Next-generation drilling equipment pushes back water depth barrier.** *Oil & Gas Journal*. March 2, 1998; 96 (9):74-78. ISSN: 0030-1388. With the 21 newly built floating rigs under construction, the capability for water-depth drilling will exceed 7,500 ft. The rigs are equipped with heavy-duty draw works, top drives, rotary tables and mud pumps.

Gaddy, Dean E. **Equipment upgrades minimize drillstring fluid losses.** *Oil & Gas Journal*. August 2, 1999; 97 (31):59-61. ISSN: 0030-1388.

Mud-bucket/spill-tray assemblies, vacuum systems, integrated rig-floor troughs, and splashguard equipment upgrades are successfully reducing drilling-fluid losses during pipe-handling operations.

Gaddy, Dean E. **DP drillships target deepwater operations.** *Oil & Gas Journal*. August 23, 1999; 97 (34):70-79. ISSN: 0030-1388.

Dynamic positioning (DP) is the new state of the art technology for drillships used in deepwater operations. Oil companies are choosing DP technology that combines computer-positioning sensors and telecommunication technologies as a means of station keeping.

Gaddy, Dean. **Coiled-tubing drilling technologies target niche markets.** *Oil & Gas Journal*. 2000; 98 (2):29-34. ISSN: 0030-1388.

Coiled-tubing drilling (CTD) has been successfully used to access hard-to reach, overlooked, and depleted reservoirs from existing wellbores. Much of this work involves sidetrack, slim-hole, under balanced, and through-tubing applications that provide distinct economic and operational advantages over conventional methods. This article provides information on current applications and prior developments, shedding light on the various rig types, markets, myths, and problems that may be encountered while working with coiled-tubing drilling.

Galt, J. A. **The integration of trajectory models and analysis into spill response information systems.** *Spill Science & Technology Bulletin*. 1997; 4 (2):123-129. ISSN: 1353-2561.

No single trajectory model can account for the uncertainties encountered in any spill, therefore this researcher proposes using a series of models to compliment one another.

Garcia-Martinez, R.; Flores-Tovar, H. **Computer modelling of oil spill trajectories with a high accuracy method.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):323-330. ISSN: 1353-2561.

A high accuracy numerical method to model oil spill trajectories using a particle-tracking algorithm is proposed in this paper.

Gilchrist, R. T., Jr. **Here are design procedures for installing deepwater PLEM.** *Oil & Gas Journal*. November 2, 1998; 96 (44):63-71. ISSN: 0030-1388. Due to high deepwater pipe tensions and the need for remote installations, pipeline-end manifolds (PLEMs) must be models of design and installation simplicity.

- Global sets pipelay record.** *Ocean News & Technology*. 2000; 6 (1):20. ISSN: 1082-6106.
Global Industries, Ltd, Mexican subsidiary, used an automatic welding system to install the Atasta pipeline. This welding substitute drives welding units around pipe joints to make high quality welds. By utilizing this automatic welding unit, Global achieved a record of pipelay production of 210 pipe joints in one day.
- Goodman, R. H.; Brown, H. M.; An, Chang-Fa; Rowe, Richard D. **Dynamic modelling of oil boom failure using computational fluid dynamics.** *Spill Science & Technology Bulletin*. 1996; 3 (4):213-216. ISSN: 1353-2561.
Fluent, a commercial computational fluid dynamics program was used to model oil-water flow around a boom. The results indicated that boom performance tests should be conducted using oil on the water, as oil changes the flow patterns around booms.
- Grierson, I. T. **Use of airborne thermal imagery to detect and monitor inshore oil spill residues during darkness hours.** *Environmental Management*. November-December 1998; 22 (6):905-912. ISSN: 0364-152X.
An airborne video system operating in visible, near infrared, and thermal wavelengths was tested for detecting oil spills under nighttime conditions. The thermal imagery proved to be the most successful, and it was suggested that a tracking buoy be used to locate the spill. The airborne imagery can then be used for more quantitative measurements.
- Hands, N.; Kowbel, K.; Maikranz, S.; Nouris, R. **Drill-in fluid reduces formation damage, increases production rates.** *Oil & Gas Journal*. July 13, 1998; 96 (28):65-69. ISSN: 0030-1388.
Production rates were nearly double the predicted rates for the subhorizontal development well treated with sodium formate drill-in fluid system.
- Hanna, I. S.; Abukhamsin, S. A. **Plant design allows drillers to reuse and recycle OBM.** *Oil & Gas Journal*. June 15, 1998; 96 (24):71-76. ISSN: 0030-1388.
Oil-based mud facilities that recycle drilling fluids and allow drillers to reuse them are described.
- Haugen, J. **Rotary steerable system replaces slide mode for directional drilling applications.** *Oil & Gas Journal*. March 2, 1998; 96 (9):65-71. ISSN: 0030-1388.
With the aid of a downhole computer, the rotary steerable system combines drilling efficiency with bent-housing motor course control. The new system also uses logging-while-drilling sensors located close to the drill bit.

- Heerema, E. P. **Major deepwater pipelay vessel starts work in North Sea.** *Oil & Gas Journal*. May 4, 1998; 96 (18):78-88. ISSN: 0030-1388.
Solitaire, a dynamically positioned pipelay vessel of about 350 m including stinger, can lay very large diameter pipe at a very high rate (6 km/day).
- Hodgins, D. O.; Salvador, S. S.; Tinis, S. E.; Nazarenko, D. **Radarsat SAR for oil spill response.** *Spill Science & Technology Bulletin*. 1996; 3 (4):241-246. ISSN: 1353-2561.
SAR can be used to monitor oil spill distributions when the sea surface is calm enough to be differentially damped by the oils. Oil thickness can also be determined using SAR.
- Hogg, Rudy S. **Storage-tank leak detection improved with cable-sensor system.** *Oil & Gas Journal*. 2000; 98 (2):46-52. ISSN: 0030-1388.
Cable-sensor systems improve leak detection from their above ground storage tanks. This simple operation provides good repeatability, because each of the two or more flasher units at each tank is a stand-alone leak-detection system.
- Intervention mast speeds well logging in North Sea.** *Oil & Gas Journal*. February 28, 2000; 98 (9):54. ISSN: 0030-1388.
A new innovative, self-contained and self-supporting unit, called the *Mast*, designed by the PSL Group, Aberdeen, minimizes the time to switch from coiled tubing to wireline logging. The *Mast* provides limited support from platform cranes and allows good maneuverability and positioning of the coiled-tubing injector. Coiled tubing is capable of handling both real time and memory logging tools.
- Jian, W.; et al. **Removal of oil pollutants in seawater as pretreatment for reverse osmosis desalination process.** *Water Research*. 1999; 33 (8):1857-1863. ISSN: 0043-1354.
Pretreatment of reverse osmosis desalination processes are used to investigate the behavior of soluble oil components in seawater and for removal of weathered oil contaminants in seawater.
- Jones, B.; Mitchelson Jacob, E. G. **On the interpretation of SAR imagery from the *Sea Empress* oil spill.** *International Journal of Remote Sensing*. March 10, 1998; 19 (4):789-795. ISSN: 0143-1161.
A modelling technique for filtering out radar backscatter due to surface waves was discussed.
- Jovancicevic, B.; Polic, P. **N-alkanes as a tool for estimation of the biodegradation of oil-type pollutants in alluvial sediments (Danube, Yugoslavia).** *Fresenius Environmental Bulletin*. 2000; 9 (3/4):232-237. ISSN: 1018-4619.

- Karafyllidis, I. **A model for the prediction of oil slick movement and spreading using cellular automata.** *Environment International*. November-December 1997; 23 (6):839-850. ISSN: 0160-4120.
- Karstad, Eirik; Aadnoy, B. S. **Temperature model provides information for well control.** *Oil & Gas Journal*. Sept. 14, 1998; 96 (37):76-84. ISSN: 0030-1388. A model is given for deriving exact temperature information from wells during drilling to aid in predicting actual bottom-hole pressures.
- Kenawy, Farouk; Ellaithy, Wael F. **Cost, lay method major factors in subsea coiled-tubing pipeline.** *Oil & Gas Journal*. 1999; 97 (44):83-90. ISSN: 0030-1388. Coiled tubing has been used in the oil and gas industry, primarily in well-servicing work. However, reeled steel pipe can be traced to applications during World War II. Since the mid-1960s, progressive developments in material capability and field-handling equipment have resulted in significant growth for the downhole coiled-tubing industry. Companies that have used this technology, and have considered or tried several installation methods, find an economic gain when compared to traditional methods.
- Knott, David. **Spray-on cure for corrosion headache.** *Oil & Gas Journal*. November 9, 1998; 96 (45):43. ISSN: 0030-1388. Enviropeel, produced for 30 years by Alocit, Ltd. of the U.K., is a thermoplastic polymer containing a corrosion inhibitor used to coat flanges, pipe work and machinery. Recent technological advances have made it possible to heat and apply Enviropeel in the field.
- Knott, David. **Deep-sea mooring test successful.** *Oil & Gas Journal*. 1999; 97 (46):38-40. ISSN: 0030-1388. A project sponsored by five major Gulf of Mexico operators has demonstrated a new ultra-deepwater mooring system for mobile drilling units. The new technology's components are expected to allow drilling units to be moored in water as deep as 10,000 ft.
- Kronfeldt, Heinz-Detlef; Schmidt, Heinar. **Submersible fiber-optic sensor system for coastal monitoring.** *Sea Technology*. November 1999; 40 (11):51-55. A European collaboration project SOFIE, and its innovative design of sensors, enable *in-situ* detection of selected pollutants, and salinity at trace levels in complex matrices.
- Lee, C. M.; Kang, K. H.; Cho, N. S. **Trapping of leaked oil with tandem oil fences with Lagrangian analysis of oil droplet motion.** *Transactions - ASME: Journal of Offshore Mechanics and Arctic Engineering*. 1998; 120 (1):50-55. ISSN: 0892-7219. Mathematical modelling was used to predict the effectiveness of tandem oil fences. Experimental models using paraffin and kerosene in the place of oil were also run. The models show that most of the leaked oil can be contained within the fences as long as the distance between the fences is approximately 10 times the draft of the fore fence.
- Lee, Kenneth; Weise, Andrea M.; St-Pierre, Sylvie. **Enhanced oil biodegradation with mineral fine interaction.** *Spill Science & Technology Bulletin*. 1996; 3 (4):263-267. ISSN: 1353-2561. Laboratory shaker-flask experiments showed that the interaction of oil and mineral fine stimulated microbial degradation of oil.
- Lehr, William J. **Modelling the benzene inhalation hazard from spilled oil.** *Spill Science & Technology Bulletin*. 1996; 3 (4):199-202. ISSN: 1353-2561. Evaporation models were combined with an air dispersion model to provide estimates of benzene evaporation from freshly spilled oil.
- Li, Z-W.; Mead, C. T.; Zhang, S.-S. **Modelling of the behavior of marine oil spills: applications based on random walk techniques.** *Journal of Environmental Sciences*. 2000; 12 (1):1-6.
- Liukkonen, S.; Ryttonen, J.; Alhimenko, A.; Kniazeva, E. **On the adhesion of oil and ice.** *Oceanographic Literature Review*. May 1998; 45 (5):823. ISSN: 0967-0653. Diesel fuel and fresh and artificially pre-altered North Sea Brent crude oil were tested on ice in air and under ice in water. Static and dynamic friction between oil and ice was indicated by inclination angle measurements.
- Lonin, Serguei, A. **Lagrangian model for oil spill diffusion at sea.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):331-336. ISSN: 1353-2561. Both the Eulerian and Lagrangian descriptions are used to determine pollutant dynamics in continuous media. A mathematical description of the vertical movement of an oil droplet in the ocean is proposed based on the Langeven equation. Analytical test results are presented.

- Lu, J.; Lim, H.; Liew, S. C. **Oil pollution statistics in Southeast Asian waters compiled from ERS SAR imagery.** *Earth Observation Quarterly*. 1999; 61;13-17.
A spatial distribution map of ocean oil pollution in Southeast Asian waters has been compiled after analyzing 2530 intermediate resolution ERA SAR quick look images. The results will help in locating potentially vulnerable areas, and serve as a reference in future ocean oil spill monitoring campaigns.
- Marsh, G. **Oil recovery-DIP method makes headway.** *Oceanographic Literature Review*. 1998; 45 (5):828. ISSN: 0967-0653.
Over 200 dynamic inclined plane (DIP) oil recovery systems are in use on oil recovery vessels worldwide. The DIP was designed by JBF Environmental Systems.
- May, R.; Schroder, P.; Sandermann, H. **Ex-situ process for treating PAH-contaminated soil with *Phanerochaete chrysosporium*.** *Environmental Science & Technology*. September 1997; 31 (9):2626-2633. ISSN: 0013-936X.
An experimental reactor system with separate soil extraction and fungal incubation units was constructed and tested. Biodegradation rates were favorable enough to consider up-scaling the system.
- McBarnet, A. **A new sense of gravity for offshore exploration.** *Offshore Engineer*. February 1999; 2;17-19.
This article outlines the history and development of 3D full tensor gradient (FTG) technology and its potential and applications for oil and gas exploration.
- Mearns, A. J. **Oil spill treating agents: Present knowledge and toxicity testing needs.** *Microscale Testing in Aquatic Toxicology: Advances, Techniques, and Practices*. CRC Press Inc; 1998; 575-590.; ISBN: 0-8493-2626-5.
- Michel, J.; Hayes, M. O. **Weathering patterns of oil residues eight years after the Exxon Valdez oil spill.** *Marine Pollution Bulletin*. 1999; 38 (10):855-863. ISSN: 0025-326X.
The objective of this study was to sample persistent oil residues, not characterize the overall rate of oil removal. Samples were collected at the same locations on the beach face over time, but at varying depths depending on visual observations of where the heaviest oil occurred. Oil residues in Prince William Sound, Alaska range from moderately to extremely weathered, eight years following the Exxon Valdez spill.
- Miller, N. J.; Mudge, S. M. **The effect of biodiesel on the rate of removal and weathering characteristics of crude oil within artificial sand columns.** *Spill Science & Technology*. 1997; 4 (1):7-33. ISSN: 1353-2561.
The removal of weathering characteristics of crude oil within artificial sand columns are thoroughly investigated using GC/MS techniques. This study focuses on the use of biodiesel (rape seed oil methyl ester), a relatively low toxicity compound and its effects on weathered and un-weathered crude oil.
- Milligan, T. G.; Hill, P. S. **A laboratory assessment of the relative importance of turbulence, particle composition, and concentration in limiting maximal floc size and settling behavior.** *Journal of Sea Research*. June 1998; 39 (3/4):227-241. ISSN: 1385-1101.
Floc size and settling velocity were shown to be significantly dependant on turbulence and type of suspended material after a 20-hour test cycle. Concentration did not appear to control floc size and settling velocity.
- Mighty Servant 1 delivers Brazilian semi submersible.** *Oil & Gas Journal*. February 28, 2000; 98 (9):54. ISSN: 0030-1388.
Recently, Dockwise's Mighty Servant 1 (MS1) set a transport weight record for a semi submersible heavy transport ship. The vessel delivered the 32,767-ton semi submersible production unit Petrobras 36 from Canada to Rio de Janeiro. Mighty Servant 1, with a deadweight capacity of 45,402 tons and the ability to submerge up to 14 m above deck, is the only vessel in the world capable of loading and carrying unit loads of this type.
- Moritis, Guntis. **Complex well geometries boost Orinoco heavy oil producing rates.** *Oil & Gas Journal*. February 28, 2000; 98 (9):42-46. ISSN: 0030-1388.
Petrozuata's heavy oil project in the Orinoco belt, Venezuela, is estimated to contain 1.2 trillion bbl of heavy and extra-heavy crude in place. The completion of the complex multilateral well for the recovery of the oil will accelerate the production rate for recovery of the oil.
- Moritis, Guntis. **Emerging technologies to boost hydrocarbon production efficiency.** *Oil & Gas Journal*. 1999; 97 (50):63-66. ISSN: 0030-1388.
Using new technologies for accelerated production, and extracting hydrocarbons, the Downhole Flow Control device directs production from different downhole intervals to allow through-tubing intervention. This method adds improved, more cost-effective methods for recovering sufficient hydrocarbons to meet projected increased demands.

- Moritis, Guntis. **Options to produce deepwater oil, gas to proliferate.** *Oil & Gas Journal*. 1999; 97 (50):69-74. ISSN: 0030-1388.
 Various subsea and floating production concepts offer a number of choices for implementing an economically viable project. Downhole development economics can be improved by increasing the production per well with such technology applications as multilateral wells, smart completions, and other technologies that are also being designed for non-deepwater environments.
- Moritis, Guntis. **Massive oil resource to be targeted by new EOR techniques.** *Oil & Gas Journal*. 1999; 97 (50):75-78. ISSN: 0030-1388.
 Mature U.S. oil fields, as well as huge Middle East oil fields, are predicted to experience steep production declines in the next millennium, and are the target for the use of EOR techniques. Significant oil can be recovered with this technically proven enhanced oil recovery technique, but economics still inhibit these methods from being widely implemented.
- Mooring world record.** *Ocean News*. 1999; 5 (5):23. ISSN: 1082-6106.
 Aker Marine Contractors (AMC) Inc. has recently set a new world water depth record for conventionally moored drilling rigs using onboard mooring systems. AMC secured the Diamond offshore drilling rig by using the rig's eight-drag embedment, high holding power anchors in water depths to 5,800 feet.
- Mullin, J. V.; Lane, J. **Ohmsett: The nation's oil spill response test facility.** *Sea Technology*. April 1998; 39 (4):57-61. ISSN: 0093-3651.
 Located on the Naval Weapons Station in Leonardo, New Jersey, Ohmsett is the world's largest tow/wave tank facility designed to be used in the testing of oil and hazardous material spills. The facility tests monitoring, clean up and detection equipment.
- Munro, P.D., et al. **Solid-phase test for comparison of degradation rates of synthetic mud base fluids used in the off-shore drilling industry.** *Environmental Toxicology and Chemistry*. October 1998; 17 (10):1951-1959. ISSN: 0730-7268.
- Neff, Jerry M.; Ostazeski, S.; Gardiner, W.; Stejskal, Iva. **Effects of weathering on the toxicity of three offshore Australian crude oils and a diesel fuel to marine animals.** *Environmental Toxicology and Chemistry*. 2000; 19 (7):1809-1821. ISSN: 0730-7268.
 Three *Australian Northwest* shelf crude oils and an Australian diesel fuel were examined for their weathering properties and chemical composition, to determine the toxicity effects on water column organisms near the surface slick within a few hours to a day after a spill.
- Neff, Jerry M.; Ostazeski, Stanley A.; Stejskal, Iva. **The weathering properties of four unique crude oils from Australia.** *Spill Science & Technology Bulletin*. 1996; 3 (4):203-205. ISSN: 1353-2561.
 Laboratory weathering experiments of four crude oils showed that the oils have very different compositions and exhibit a wide range of physical and chemical properties.
- New floating disk skimmer recovers oil.** *Oil & Gas Journal*. August 23, 1999; 97 (34):85. ISSN: 0030-1388.
 The new high efficiency skimmer, RO-DISC, is for inland waters, and process applications such as separators and tanks. Oil is recovered from the water surface as it adheres to the disk surface. The skimmer offers efficiency rates up to 99%.
- Nenkov, N. D.; Bednarz, Stanislaw; Nedyalkov, P. V. **Wire line retrieval coring technology shows promise.** *Oil & Gas Journal*. August 2, 1999; 97 (31):62-64. ISSN: 0030-1388.
 Incorporating wire line retrievable coring technology with slim-hole drilling operations is important for remote, difficult, and ecologically vulnerable regions. This new technique minimizes environmental damage by reducing drilling wastes and can be used with less expensive mining exploration rigs or high technology, automated slim-hole drilling rigs.
- Nicodem, David E., et al. **Photochemical processes and the environmental impact of petroleum spills.** *Biogeochemistry*. 1997; 39 (2):121-138. ISSN: 0168-2563.
 This article is a review of the process of biodegradation and its interaction with photochemical treatment. The review emphasizes processes of emulsification, water solubility, and toxicity.
- Nielsen, Rod A., et al. **Deepwater production drives design of new gulf gas plant.** *Oil & Gas Journal*. March 16, 1998; 96 (11):87-90. ISSN: 0003-1388.
 The Destin pipeline and the Pascagoula gas-processing plant are being built to handle the successful deepwater, eastern Gulf of Mexico gas production.
- Nwokoma, M. **Nigeria's Escravos gas project starts up.** *Oil & Gas Journal*. April 20, 1998; 96 (16):78-84. ISSN: 0030-1388.
 Chevron Nigeria Ltd. and Nigerian National Petroleum Corp. began processing gas in November 1997 in Escravos. The gas plants are described.

Oebius, Horst U. **Physical properties and processes that influence the clean up of oil spills in the marine environment.** *Spill Science & Technology*. 1999; 5 (3/4):177-289. ISSN: 1353-2561.

The material featured in this special issue of *Spill Science & Technology Bulletin* was initially prepared and published in German, as a technical report. This review addresses the fundamentals and physical properties that govern the control of spilled liquid chemicals in water, particularly with respect to oil.

Offshore service companies prepare development concepts for W. Africa's deepwater finds. *Oil & Gas Journal*. January 18, 1999; 97 (3):39-44. ISSN: 0030-1388.

Four flow enhancement methods were considered to optimize output from the West African Deepwater wells.

Oil and debris recovery technology for ports, rivers and sheltered coastal waters. *Spill Science & Technology Bulletin*. 1997; 4 (4):267. ISSN: 1353-2561.

The new design of a twin-circus 8-meter oil and debris recovery catamaran allows for faster, more effective recovery sweeps and high maneuverability.

Oil spills: mechanical or chemical combatting? *Oceanographic Literature Review*. 1998; 45 (5): 828. ISSN: 0967-0653.

The article reviews the European and U.S. preferred mechanical and chemical methods for combatting oil spills.

Oil slicks in a roll. *Marine Pollution Bulletin*. 2000; 40 (5):363. ISSN: 0025-326X.

"Hydrogel" developed by scientists at the University of Bradford, UK, is made up almost entirely of water but is one thousand times stronger than other gels of similar design. A molecular cross which links two separate polymers makes it much stronger, existing halfway between a liquid and a solid. The hydrogel is sprayed onto the oil spill, and once it has thickened, it is rolled up and removed.

Oradovskii, S. G.; et al. **Calculation of petroleum product transport from emission sources in the Gulf of Taganrog of the Sea of Azov.** *Russian Meteorology and Hydrology*. 1999; 5:49-59. ISSN: 1068-3739.

Orbell, J. D., et al. **Oil spill remediation using magnetic particles - An experiment in environmental technology.** *Journal of Chemical Education*. December 1997; 74 (12):1446-1448. ISSN: 0021-9584.

Students ran an experiment using steel 'isoshot' pellets coated with an oil-absorbing polymer (polyethylene or polyvinylchloride) to soak up spilled oil. The beads may also be recycled and the oil reclaimed.

Osadchy, V. U.; Shifrin, K. S.; Gurevich, I. Y. **The airborne identification of oil films at the Caspian Sea surface using CO₂ lidar.** *Oceanologica Acta*. 1999; 22 (1):51-56. ISSN: 0399-1784.

A series of tests were conducted over the Caspian Sea from an aircraft carrying a CO₂ laser sensor. This method was used to estimate the contribution of reflectivity of seawater and oil films on seawater, and the damping effect by the oil film on the sea waves. The spectral behavior of the contrast and its relationship with the film thickness was calculated from an undisturbed sea surface.

Oyeneyin, M. Babs. **Sand, gravel properties key to optimum designs.** *Oil & Gas Journal*. January 26, 1998; 96 (4):84-87. ISSN: 0300-1388.

The first article in a three part series covers key factors that influence effective sand control.

Page, C. A. **Behavior of chemically dispersed oil and whole oil on a near-shore environment.** *Water Research*. 2000; 34 (9):2507-2516. ISSN: 0043-1354.

Experiments were conducted in wave tanks to simulate oil spills in a surf-zone environment. The behavior of whole oil and dispersed oil were analyzed over a 10-day period, as were sediments and the water column. 49% of whole oil sorbed to sediments and other surfaces, while virtually no sorption occurred in the chemically dispersed oil tank. The chemical dispersant was effective in eliminating the build-up of oil residue in the beach substrate.

Parascin, D. **Welding enclosure eliminates platform shut-in.** *Oil & Gas Journal*. May 4, 1998; 96 (18):90-92. ISSN: 0030-1388.

A self-contained welding habitat allows welding to occur in well bays on offshore platforms without shutting off all other wells.

Partidas, Carmen J.; Trebbau, Gariela; Smith, Thomas L. **Microbes aid heavy oil recovery in Venezuela.** *Oil & Gas Journal*. 1998; 96 (24):62-64. ISSN: 0030-1388.

Microbial treatments in Lake Maracaibo included Para-Bac/S, Ben-Bac and Corroso-Bac. Overall, the treated reservoirs showed oil production increases from 50-200%.

Payne, John W. **First fiber optic cable system in the Gulf of Mexico.** *Sea Technology*. 1999; 40 (9):59-65. ISSN: 0093-3651.

A fiber optic cable system called the FiberWeb, is currently being installed by Petroleum Communications Inc., (PetroCom®), in the Gulf of Mexico. The use of Fiber Web's advanced technology promises to revolutionize the engineering of future offshore oil platforms and will provide a number of enhanced services that will transform how work is performed offshore.

Payne, M. L.; Sathuvalli, R. B. **Pipe-collapse issues provide economic opportunities.** *Oil & Gas Journal*. February 21, 2000; 98 (8):38-46. ISSN: 0030-1388. This report reassesses the well economics and operations of conventional design methodology used in drilling casing design.

PDVSA modernizes controls at the Jusepin oil production complex. *Oil & Gas Journal*. February 21, 2000; 98 (8):63-67. ISSN: 0030-1388. Petroleos de Venezuela S. A., is upgrading its Jusepin production complex serving the Furrial oil field, east of Caracas, to automatic controls. This integrated automation technology will replace electronically monitored local pneumatic instruments.

PetroCom enhances product portfolio. *Sea Technology*. 2000; 41 (1):84. ISSN: 0093-3651. The first-ever voice paging service to the offshore oil and gas industry is being provided by Petroleum Communications Inc. (PetroCom), Houston, Texas. The paging system will allow users to receive voice messages from a small handset, comparable in size to a pager. PetroCom is currently building FiberWebsm, the first fiber-optic cable network in the Gulf of Mexico and on land from Houston to New Orleans. This advanced technology will provide offshore oil production platforms with the infrastructure for high-volume, high-speed voice, data, and video capabilities.

Petrobras sets milestone. *Ocean News & Technology*. 2000; 6 (1):20. ISSN: 1082-6106. The deepwater drillship *Peregrine 4*, owned by R&B Falcon, and operating for Petrobras offshore Brazil, used a state-of-the-art Multiplexed Drilling Control System to establish an ultra-deepwater well in 9,111 feet of water.

Petzet, G. Alan. **Chevron starts U.S. Gulf's first lower cretaceous flow.** *Oil & Gas Journal*. 1998; 96 (24):85-86. ISSN: 0030-1388. Chevron's Mobile 991 No. 1 well will begin the company's production of gas from lower cretaceous rocks in the Gulf of Mexico.

Pipeline spill drill tests industry's response capability. *Oil & Gas Journal*. August 18, 1997; 95 (33):22. ISSN: 0030-1388. An emergency-response oil spill drill was staged in the Houston Ship Channel in August 1997. Three government agencies and people from nine major oil companies participated in the drill.

Rahman, A. R. A.; Al-Thani, N. H.; Ishikura, M.; Kikkawa, Y. **First LNG from North field overcomes feed, start-up problems.** *Oil & Gas Journal*. Aug. 24, 1998; 96 (34):41-47. ISSN: 0030-1388. The article discusses the landmark achievements for the Qatar Gas LNG in the North field.

Rasheed, Wajid.; Jones, Mike.; Betts, Mick. **Underreaming technologies provide array of applications.** *Oil & Gas Journal*. February 21, 2000; 98 (8):47-52. ISSN: 0030-1388.

Underreaming is a new application for deepwater drilling. This technology differs from bicenter bits in that it features a two-piece design, allowing for greater flexibility in pilot bit selection. Directional control is conducted through a steerable motor. Underreaming can provide significant time and cost savings.

Rayson, M. **Oil companies underscore importance of geodetic positioning.** *Oil & Gas Journal*. July 6, 1998; 96 (27):72-79. ISSN: 0300-1388.

Recent field examples are given detailing geodetic problems along with step-by-step directions for correcting the drilling mishaps.

Riazi, M. R.; Edalat, M. **Prediction of the rate of oil removal from seawater by evaporation and dissolution.** *Oceanographic Literature Review*. September 1997; 44 (9):1049. ISSN: 0967-0653.

This paper reports on the methods used to determine the effects of temperature and salt concentration on the rate of oil vaporization and dissolution for an oil spill floating on the surface.

Ridout, P. **Oil out of the blue.** *Sea Technology*. 1999; 40 (4):37-39. ISSN: 00993-3651.

This article describes the challenges of deepwater engineering for the oil industry. Structures that sit on the seabed in deep-water sites must withstand height pressures and low temperatures and prohibit the ingress of seawater or the escape of oil, thereby increasing the demands of long-term reliability of equipment.

ROS wellhead system. *Ocean News & Technology*. 2000; 6 (1):20. ISSN: 1082-6106.

A deepwater wellhead inspection system will be installed on Petrobras' *Peregrine 23* deepwater drilling vessels. The stainless steel system is rated to 3,000 meters, consist of two color zoom cameras, two HID lights, and two pan & tilt units. The system is operated by a single subsea control bottle and connected with stainless steel armored PBOF cables and connectors to Cameron Controls MUX. The systems' telemetry and video will be transmitted via fiber optics; position feedback will allow the system to work on most major topside camera networks.

- Sanni, S.; Øysaed, K. B.; Høivangli, V.; Gaudebert B. A. **continuous flow system (CFS) for chronic exposure of aquatic organisms.** *Marine Environmental Research*. 1998; 46 (1/5):97-101. ISSN: 0141-1136.
This paper details a continuous flow system that is a flexible tool, adjustable to a wide range of experiments. The system can be run with fresh or salt water, with multiple species of organisms simultaneously, and pollutants can be introduced into the system in a number of different ways.
- Satellites on oil spill patrol.** *Marine Pollution Bulletin*. 1998; 36 (4):252. ISSN: 0025-326X.
Centre for Remote Imaging, Sensing and processing (CRISP) are developing and using satellites to monitor ship movement and to detect oil pollution if it occurs.
- Shaughnessy, J. M.; Herrmann, R. P. **Concentric riser will reduce mud weight margins, improve gas-handling safety.** *Oil & Gas Journal*. November 2, 1998; 96 (44):54-62. ISSN: 0030-1388.
A high-pressure concentric riser is pre-run with a casing string inside attached to a seafloor blowout preventer. A second blowout preventer is attached to the casing string at the surface, thus containing the gas pressure, and allowing for a dual-density mud system.
- Shell claims record for ESP tieback.** *Oil & Gas Journal*. January 26, 1998; 96 (4):47. ISSN: 0030-1388.
Shell U.K. Exploration & Production has supposedly completed the world's longest subsea tieback of an electrical submersible pump (ESP). The ESP offers new possibilities for development of satellite fields.
- Skaug, L. C. **New designs advance spar technology into deeper water.** *Oil & Gas Journal*. November 2, 1998; 96 (44):53. ISSN: 0030-1388.
Recent spar technology developments include a spar designed for drilling in waters over 8,000 ft and a split-tree production riser system for spars in ultra deepwater.
- Stelmaszewski, A. **Selected physical properties of Baltic crude oil.** *Oceanologia*. 1998; 40 (1):11-25. ISSN: 0078-3234.
- Stokes, D. J.; Thiel, B. L.; Donald, A. M. **Direct observation of water-oil emulsion systems in the liquid state by environmental scanning electron microscopy.** *Langmuir*. August 4, 1998; 14 (16):4402-4408. ISSN: 0743-7463.
Environmental scanning electron microscopy can image fluid systems in their natural state at significantly higher resolutions than conventional optical microscopy.

- Szczepanski, R.; Edmonds, B.; Brown, N.; Hamilton, T. **Research provides clues to hydrate formation and drilling-hazard solutions.** *Oil & Gas Journal*. March 9, 1998; 96 (10):52-56. ISSN: 0030-1388.
The article discusses the conditions under which hydrates form, lists hydrate molecules likely to form or to be encountered while drilling, and offers techniques for dealing with them.
- Tinis, Scott, W.; Hodgins, Donald O.; Fingas, Merv. **Assimilation of radar measured surface current fields into a numerical model for oil spill modelling.** *Spill Science & Technology Bulletin*. 1996; 3 (4):247-251. ISSN: 1353-2561.
Data from a SeaSonde portable shore-based HF radar system were blended with numerical model fields and used as input for a set of auto-regressive moving-average (ARMA) statistical models.
- Toyoda, M.; Inagaki, M. **Heavy oil sorption using exfoliated graphite - New application of exfoliated graphite to protect heavy oil pollution.** *Carbon*. 2000; 38 (2):199-210. ISSN: 0008-6223.
The sorption of heavy oils into exfoliated graphite's was studied using four kinds of heavy oils with different viscosities. The sorption mechanism of heavy oils onto graphite must be clarified to determine the most appropriate exfoliation conditions of graphite, and to develop effective and practical techniques to recover heavy oil from sorbed graphite.
- True, Warren R. **Subsea pipelay systems, repair tools advance.** *Oil & Gas Journal*. September 6, 1999; 97 (36):52-54. ISSN: 0030-1388.
Italian contractor Saipem, introduced the world's largest J-lay semi submersible crane tower earlier this year. The vessel Sunrise 2000, has been upgraded to Class III dynamic-positioning vessel and combined with the J-lay tower system has successfully complete sea trials, which included a diverless repair of a subsea pipeline in a project the company said was the deepest flow line repair on the sea floor ever attempted.
- True, Warren R. **Deepwater pipeline-repair system deployed to Mediterranean.** *Oil & Gas Journal*. November 16, 1998; 96 (46):80-83. ISSN: 0030-1388.
The Arcos diverless repair system, designed by Sonsub International Inc., locates damaged section of pipe, removes it, connects the remaining open ends of pipe with a spool piece and returns the damaged section to the surface.
- Tumeo, M. A.; Cote, A. **Effect of flush water temperature and type on commercial shoreline cleaning agent efficiency.** *Journal of Soil Contamination*. 1998; 7 (2):213-226. ISSN: 1058-8337.

U. K. firm unveils new platform design. *Oil & Gas Journal*. November 30, 1998; 96 (48):24. ISSN: 0030-1388.
Arup energy has unveiled a low-cost oil production platform. The base structure is laid out on the seabed floor, and the topsides unit, which consists of a barge and jackable legs, is secured to the base.

Valusek, Jay E. Unocal Thailand slashes well planning cycle time. *Oil & Gas Journal*. December 28, 1998; 97 (2):45-48. ISSN: 0030-1388.
Cycle times were greatly reduced by integrating seismic interpretation and well-path design throughout the well-planning stage and drilling operation for natural gas in Thailand.

van Weering, Dr. Tjeerd.; van Herrwaarden, Johan.; Thomsen, Dr. Laurenz; Viergutz, Thomas. New technique for long-term deep seabed studies. *Sea Technology*. 2000; 41 (2):17-26. ISSN: 0093-3651.
This article describes the Modular Seabed Lander (BOBO II) that is designed for *in-situ* measurements of the lowermost 2.5 meters of the benthic boundary layer, in water depths down to 5,000 meters. This new instrument will provide long-term, detailed, and high-resolution monitoring of environmental conditions from the rapidly increasing exploration of deeper parts of the continental margin.

van Wijck, Michiel; Bassett, Stephen. Controller installation pays off for North Sea oil terminal. *Oil & Gas Journal*. October 4, 1999; 97 (40):80-83. ISSN: 0003-1388.
BP Amoco's crude oil stabilization plant has installed the Honeywell RMPCT multivariable controller at the front end of the plant where dissolved gas is separated from crude oil. The multivariable controller has help to reduce fuel consumption, loss to flare, and the probability of cut backs in North Sea crude oil production.

Veire, Helene, et al. New methods boost 4D seismic role in reservoir management. *Oil & Gas Journal*. Sept. 14, 1998; 96 (37):41-46. ISSN: 0030-1388.
Seismic 3D surveys are repeated, and the changes in the seismic response during the lapse time are attributed to changes in fluid saturation, pressure and temperature of the reservoir. The article discusses various methods of obtaining repeatability of readings.

Vollmer, D. P., et al. Low-corrosion brine provides high-temperature completion alternative. *Oil & Gas Journal*. Aug. 24, 1998; 96 (34):48-55. ISSN: 0030-1388.
A new non-halide brine composed of sodium salts of carboxylic acid has been used to complete four high-temperature wells in the Gulf of Mexico.

Wacker, H. Jason; Parker, Robert M. Test proves out triple-action pump in downhole separation. *Oil & Gas Journal*. October 4, 1999; 97 (40):49-55. ISSN: 0003-1388.

The triple-action pumping system (TAPS) has been tested for separating oil and water downhole in the wellbore. This new system included several breakthroughs that will push gravity-segregation technology towards widespread industry and government acceptance. By virtue of its capability to inject at high pressure, TAPS provides a new, less-costly, method for waterflooding.

Walz, M. A. Second phase evaluation of a protocol for testing a fire resistant oil spill containment boom. *Spill Science & Technology Bulletin*. 2000; 5 (5/6):341-345. ISSN: 1353-2561.

In situ burning of oil at sea calls for the use of a fire resistant boom to contain the oil during a burn. Presently, there is no standard method for the use of fire-resistant booms to evaluate the anticipated performance of different booms. Therefore, a second series of experiments was conducted to evaluate a protocol for testing the ability of fire-resistant booms to withstand both fire and waves.

Wang, H.; Priestman, G. H.; Beck, S. B. M.; Boucher, R. F. A remote measuring flow meter for petroleum and other industrial applications. *Measurement Science & Technology*. May 1998; 9 (5):779-789. ISSN: 0957-0233.

The blown venturi flow meter was investigated. Predictions of pressure pulse strength, pressure loss and frequency for the flow meter in an oil production string were made.

Warren, Tommy. Technology gains momentum. *Oil & Gas Journal*. December 21, 1998; 96 (51):101-105. ISSN: 0030-1388.

This article, the first in a two part series, compares the differences between conventional mud motor-based directional drilling systems and rotary-steerable systems. The second article will define implementation issues with which operators should be concerned.

Warren, Tommy. Implementation issues concern operators. *Oil & Gas Journal*. December 28, 1998; 96 (52):80-83. ISSN: 0030-1388.

Significant benefits from rotary-steerable systems can be gained during the well-planning and drilling execution phases for directional wells. Well design changes must be implemented to take advantage of the unique benefits of a rotary-steerable system.

- Wilhelm, R.; Franceware, L. B.; Guzman, C. E. **Seismic pressure-prediction method solves problem common in deepwater Gulf of Mexico.** *Oil & Gas Journal*. Sept. 14, 1998; 96 (37):67-75. ISSN: 0030-1388.
The normal pressure interval travel time (ITT)-shale compaction trend is established using a significantly thick, hydrostatically pressured section of the shelf model. The article describes the method and gives successful case studies for shelf and deepwater wells.
- Wilson, N. G.; Bradley, G. **A study of a bacterial immobilization substratum for use in the bioremediation of crude oil in a saltwater system.** *Journal of Applied Microbiology*. October 1997; 83 (4):524-530. ISSN: 1364-5072.
Dritzit immobilization matrix was examined using a number of tests. Dritzit was found to be ideal for bioremediation of oil. It exhibited good cell-loading capacity and high oil absorbency.
- World's deepest on-bottom pipeline repair.** *Ocean News*. 1999; 5 (5):23. ISSN: 1082-6106.
Ocean Intervention and Oceaneering WASP atmospheric diving system assisted by an ROV has completed the repair of a subsea pipeline system using diverless procedures in water depths up to 1,000 feet. This repair is believed to be the deepest flow line repair ever attempted. The pipeline covers over 14 miles of the Gulf's bottom and connects the Mariner Energy's Dulcimer subsea to the Chevron platform.
- Wylde, Richard. **UK changes coordinate system west of Britain.** *Oil & Gas Journal*. February 28, 2000; 98 (9):47-48. ISSN: 0030-1388.
The Oil & Gas Licensing Division of the United Kingdom Department of Trade & Industry, has selected a pragmatic unambiguous approach for the petroleum industry users to merge positional data throughout the UK and its continental shelf. This system provides an important step in ensuring the spatial integrity of offshore geotechnical data.
- Yapa, Poojitha D.; Zheng, Li. **Modelling oil and gas releases from deep water: a review.** *Spill Science & Technology Bulletin*. 1997; 4 (4):189-198. ISSN: 1353-2561.
This paper reviews the methods used to numerically model underwater oil and gas plumes, and gives a complete reference for these models.

- Yeung, P. Y.; Johnson, R. L.; Xu, J.G. **Biodegradation of petroleum hydrocarbons in soil as affected by heating and forced aeration.** *Journal of Environmental Quality*. November-December 1997; 26 (6):1511-1516. ISSN: 0047-2425.
A contaminated sample was tested under different bioremediation facility treatments. Heating affected hydrocarbon degradation more than forced aeration, although both had positive outputs.
- Yost, K.; Lopez, J. R.; Mok, J. **Topsides equipment, operating flexibility key floating LNG design.** *Oil & Gas Journal*. March 9, 1998; 96 (10):67-72. ISSN: 0030-1388.
This article features the design for a large-scale floating liquefied natural gas plant, which is technically feasible, economical, safe and reliable.
- Zhang, D. F.; Easton, A. K.; Steiner, J. M. **Simulation of coastal oil spills using the random walk particle method with Gaussian Kernel weighting.** *Spill Science & Technology Bulletin*. 1997; 4 (2):71-88. ISSN: 1353-2561.
The highlights of this modelling procedure include performing calculations at closed boundaries consisting of a variety of shoreline types, calculations of open boundaries with an extended computation region, and determination of the mass concentration of the spill.

Abdel-kader, A. F.; Nasr, S. M.; El-Gamily, H. I.; El-Raey, M.
Environmental sensitivity analysis of potential oil spill for Ras-Mohammed coastal zone, Egypt.
Journal of Coastal Research. Spring 1998; 14 (2):502-511. ISSN: 0749-0208.

SPOT-XS remote sensing images, topographic information, and field survey data were combined with GIS modelling to develop land use/land cover; shoreline and foreshore sensitivity; and critical natural resources maps of the Ras-Mohammed study area. The information was used in area protection planning.

Al Bakri, D.; Kittaneh, W. **Physicochemical characteristics and pollution indicators in the intertidal zone of Kuwait: implications for benthic ecology.**
Environmental Management. May-June 1998; 22 (3):415-424. ISSN: 0364-152X.

High temperature and salinity is suspected to restrict benthic fauna diversity. Benthic faunas in areas of high TOC and TDS concentrations were showing signs of degradation.

Al Bakri, D.; Behbehani, M.; Khuraibet, A. **Quantitative assessment of the intertidal environment of Kuwait I: Integrated environmental classification.**
Journal of Environmental Management. December 1997; 51 (4):321-332. ISSN: 0301-4797.

Al-Madfa, H.; Abdel-Moati, M.; Al-Naama, A. **Beach tar contamination on the Qatari coastline of the Gulf.**
Environment International. 1999; 25 (4):505-513. ISSN: 0160-4120.

Due to the relatively high intensity of oil activity in the Persian Gulf, tar pollution has become a serious problem along the coastlines. Beach tar concentrations were collected and measured from 11 locations along the Qatari coastline. Tar concentrations varied in space and time with values ranging between 2 and 1132 g m⁻¹ (average 290 g m⁻¹) of beachfront. Strict regulations on ballast water disposal into the Gulf has led to a clear declination in tar depositions since 1993, reaching baseline limits in some locations.

Baker, J. M. **Ecological effectiveness of oil spills countermeasures: how clean is clean?** *Pure and Applied Chemistry*. 1999; 71 (1):135-151. ISSN: 0033-4545.

This review addresses the issues of contingency planning along with ecological and socioeconomic considerations for oil spill clean up methods. 'Operational feasibility', the practicality and feasibility of the proposed actions to achieve the ecological objective, must be re-evaluated at the time of the spill, taking into consideration real time conditions.

Balbinski, E. F.; Fishlock, T. P.; Goodyear, S. G.; Jones, P. I. R. **Key characteristics of three-phase oil relative permeability formulations for improved oil recovery predictions.** *Petroleum Geoscience*. 1999; 5 (4):339-346. ISSN: 1354-0793.

Banat, I. M.; Hassan, E. S.; Elshahawi, M. S.; Abuhilal, A.H. **Post-Gulf-War assessment of nutrients, heavy metal ions, hydrocarbons, and bacterial pollution levels in the United Arab Emirates coastal waters.**
Environment International. January-February 1998; 24 (1/2):109-116. ISSN: 0160-4120.

Bermudan caves used as oil dump by Royal Navy. *Marine Pollution Bulletin*. September 1997; 34 (9):683. ISSN: 0025-326X.

A three-year clean up is underway of an estimated one million gallons of oil waste found in caves near the old *HMS Malabar* in Bermuda. The Royal Navy has been dumping in the area for decades. The reclaimed oil is being used in road construction.

Beyeler, Marc. **Radical surgery at Avila Beach.** *California Coast & Ocean*. 2000; 16 (1):3-9. ISSN: 1052-5823. The author traces the troubled history of Avila Beach and various forms of oil spills, including the discovery by Unocal of 400,000 pounds of petroleum products leaking underground, which resulted in the decision to excavate the beachfront and a sizeable section of town known as Front Street. The author laments the destruction of the Front street area, known for its unique charm.

The black waters of Karachi Harbor. *Marine Pollution Bulletin*. September 1997; 34 (9):683. ISSN: 0025-326X.

Frequent spillage of oil transported from ships in the Karachi Harbor, Pakistan to storage tanks and then to ground transport tankers is leaving the waters in the Harbor black and smelling of oil. Karachi Harbor has no adequate pipes to deal with the spillage, and it appears the Harbor has escaped environmental assessment in the past.

Burns, K.A., et al. **Dispersion and fate of produced formation water constituents in an Australian Northwest Shelf shallow water ecosystem.** *Marine Pollution Bulletin*. 1999; 38 (7):593-603. ISSN: 0025-326X.

An offshore production platform located on the Australian Northwest Shelf, in a shallow tropical marine ecosystem, is being used as a study site for evaluating produced formation water (PFW). A combination of oceanographic, geochemical, chemical and biological assessment methods is crucial to improving the understanding of distribution and fate of petroleum hydrocarbons and added nutrients being discharged from the platform into the shallow ecosystem.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

Butler, J. N.; Wells, P. G.; Johnson, S.; Manock, J. J. **Beach tar on Bermuda: recent observations and implications for global monitoring.** *Marine Pollution Bulletin*. June 1998; 36 (6):458-463. ISSN: 0025-326X.

A correlation is shown between the beach tar on a south-facing open ocean beach of Bermuda and the estimated input to the North Atlantic Ocean from oil spills and drilling operations.

Carter, T. **The Sea Empress oil spill.** *Water and Environment Manager*. 1998; 3 (3):10-11. ISSN: 0967-0653.
The oil spill and subsequent clean-up are described. The effects of the oil spill on fish and birds are evaluated.

China's oil imports raise possible boom for U. S. *Oil & Gas Journal*. 1999; 97 (23):24-26. ISSN: 0030-1388.
A new study assesses China's rapidly growing need for imported oil can serve as the basis for constructive U. S. diplomacy throughout Asia. With domestic production unlikely to change and economic growth lifting oil demands, China soon will become a world-class oil importer.

Cuthbertson, Zoe. **Pollution threat from HMS Royal Oak.** *Marine Pollution Bulletin*. 1998; 36 (10):761-762. ISSN: 0025-326X.
Nearly 60 years ago, a battleship sank in Scapa Flow, in the Orkney Islands. Recently, oil has begun to leak from the wreck. The UK's Ministry of Defense and Orkney Islands Council are initiating environmental and engineering studies and continuing to look for a long-term solution to the problem.

Danube clean-up. *Marine Pollution Bulletin*. 1999; 38 (8):625. ISSN: 0025-326X.
As a result of NATO's bombing campaign in the war over Kosovo, oil refineries and chemical plants on the banks of the river Danube, and its tributaries in Yugoslavia, were among targets. Reports of large amounts of toxic chemicals and oil leaked into the river because of the bombing.

Deis, D. R.; French, D. P. **The use of methods for injury determination and quantification from natural resource damage assessment in ecological risk assessment.** *Human and Ecological Risk Assessment*. August 1998; 4 (4 Part 2):887-903. ISSN: 1080-7039.

Delaune, R. D.; Lindau, C. W.; Jugsujinda, A. **Effectiveness of "Nochar" solidifier polymer in removing oil from open water in coastal wetlands.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):357-359. ISSN: 1353-2561.

A field experiment conducted in a coastal wetland area in Louisiana was used to determine the effectiveness of a solidifier for the removal of South Louisiana Crude. Results demonstrated that the solidifier under certain conditions might be an option for removing oil from wetlands.

Dixon, I. **Nigerian oil spill.** *Marine Pollution Bulletin*. February 1998; 36 (2):115-116. ISSN: 0025-326X.
Off the coast of Nigeria, a pipeline rupture at the Idoho platform spilling forty thousand barrels of crude oil. In little more than two weeks, the slick had spread over 90% of the Nigerian coast. This caused large fish kills, damage to coastal vegetation and soil, and human illness due to contaminated drinking water.

Douabul, A. A. -Z.; Al-Shiwafi, Nabeel A. **Dissolved/dispersed hydrocarbons in the Arabian region.** *Marine Pollution Bulletin*. 1998; 36 (10):844-850. ISSN: 0025-326X.
The purpose of this research was to estimate the impact of chronic petroleum discharges on the Arabian ecosystem and to devise monitoring strategies for long-term environmental quality assessment.

Engelhardt, F. R. **A perspective on the application of chemistry to oil spill response.** *Pure and Applied Chemistry*. 1999; 71 (1):1-4. ISSN: 0033-4545.
This review reflects the current state of knowledge in topic areas of the most recent surge in research and development activities, for oil spill response; stimulated particularly by the *Exxon Valdez* spill in Prince William Sound, Alaska in 1989. It appears that oil spill research undergoes cycles of interest, activity and funding, linked to key oil spills. Effectively every element of an oil spill, whether it is environmental, physical, operational or legal, is related to the complex chemistry of the oil and its breakdown products released to the environment.

Feder, H. M.; Blanchard, A. **The deep benthos of Prince William Sound, Alaska, 16 months after the Exxon Valdez oil spill.** *Marine Pollution Bulletin*. February 1998; 36 (2):118-130. ISSN: 0025-326X.
The studies of the deep benthos 16 months after the *Exxon Valdez* oil spill showed no significant signs of oil pollution remained.

Fiocco, R. J.; Lewis, A. **Oil spill dispersants.** *Pure and Applied Chemistry*. 1999; 71 (1):27-42. ISSN: 0033-4545.
The chemistry and physics of dispersants, planning and decision-making considerations, and finally their practical application and operational use in oil spill response is discussed.

Gabbasova, I. M.; Abdrakhmanov, R. F.; Khabirov, I. K.; Khaziev, F.K. **Changes in soil properties and groundwater composition under the impact of pollution by oil and sewage waters from the oil fields of Bashkortostan.** *Eurasian Soil Science*. November 1997; 30 (11):1219-1229. ISSN: 1064-2293.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

Galt, J. A. **Uncertainty analysis related to oil spill modeling.** *Spill Science & Technology Bulletin*. 1997; 4 (4):231-238. ISSN: 1353-2561.

A digital standard was developed for implementing 'minimum regret' strategic approach to delivering forecast information into a spill response system.

Gilfillan, E. S.; et al. **A comparison of shoreline assessment study designs used for the Exxon Valdez oil spill.** *Marine Pollution Bulletin*. 1999; 38 (5):380-388. ISSN: 0025-236X.

Three shoreline assessment programs were conducted after the Exxon Valdez oil spill to examine the study design, analysis methods, and ability to detect oil spill effects.

Glassom, D.; Prochazka, K.; Branch, G. M. **Short-term effects of an oil spill on the west coast of the Cape Peninsula, South Africa.** *Oceanographic Literature Review*. May 1998; 45 (5):827. ISSN: 0967-0653. Survey data taken directly after an oil spill, as a result of the Apollo Sea sinking in 1994, was compared with data taken two months before the spill. Results are presented.

Gray, J. S.; Bakke, T.; Beck, H. J.; Nilssen, I. **Managing the environmental effects of the Norwegian oil and gas industry: from conflict to consensus.** *Marine Pollution Bulletin*. 1999; 38 (7):525-530. ISSN: 0025-326X.

In the late 1960's, the first exploitation of oil resources began on Norway's continental shelf, and there was little control over environmental impacts. Some 20 years later, Norwegian authorities started imposing restrictions on discharges of oil-based drilling cuttings to sea on the Norwegian shelf. A final implementation of changing Norway's offshore monitoring from field based monitoring of sediments, to a regional monitoring of both sediments and the water column. By doing so, the changes make it possible to obtain a better overview of the environmental conditions.

Harris, B. C.; Bonner, J. S.; Autenrieth, R. L. **Nutrient dynamics in marsh sediments contaminated by an oil spill following a flood.** *Environmental Technology*. 1999; 20 (8):795-810. ISSN: 0959-3330. A group of pipelines ruptured during floodwaters, releasing crude oil, diesel fuel and gasoline into the San Jacinto River near Houston, TX. During a period of over a year following the spill, natural levels of the nutrient analytes were estimated by monitoring their values. Data suggest that nutrient dynamics, with the associated environmental disturbances (flood, erosion, fire, and deposition) provided favorable conditions for the degradation of the petroleum contamination.

Hofer, T. **Tanker ships in the marine environment - Part IV: Regulations to recent marine pollution tankships in the marine environment.** *Environmental Science and Pollution Research*. 1999; 6 (2):107-114. ISSN: 0944-1344.

Husain, T. **Terrestrial and atmospheric environment during and after the Gulf War.** *Environment International*. January-February 1998; 24 (1/2):189-196. ISSN: 0160-4120.

Irvine, G. V.; Mann, D. H.; Short, J. W. **Multi-year persistence of oil mousse on high energy beaches distant from the Exxon Valdez spill origin.** *Marine Pollution Bulletin*. 1999; 38 (7):572-584. ISSN: 0025-326X.

Weathering of oil mousse that is trapped on the shoreline of the Katmai National Park and Preserve is due to the intertidal zone being armored by large boulders, which prevent waves from disturbing the substrate and its included oil. Although a biological threat is posed by the stranded oil, it is probably slight. The oil could have the ability to be chemically toxic if released through disturbance of the armoring boulders by unusually high wave events.

Kim, J. Y.; Song, M. G.; Kim, T. S.; Kim, J. D. **Effectiveness of a new water-based oil spill dispersant comprised of an alkyl polyglycoside.** *Journal of Surfactants and Detergents*. 1999; 2 (4):539-544. ISSN: 1097-3958.

In order to create an effective and environmentally safe recovery of spilled oil, accelerating the break up of oil is critical. Chemical agents which contain a surfactant adsorb at the oil/water interface and reduce the interfacial tension of seawater. This article introduces alkyl polyglycoside (AP) and its use with a water-based oil spill dispersant, which shows maximal performance at typical concentrations.

Kirchgessner, D. A., et al. **Estimate of methane emissions from the US natural gas industry.** *Chemosphere*. September 1997; 35 (6):1365-1390. ISSN: 0045-6535.

Kizu, R.; Ando, K.; Hayakawa, K. **Oil spill accident in the Sea of Japan.** *Japanese Journal of Toxicology and Environmental Health*. October 1998; 44 (5):321-333. ISSN: 0013-273X.

Knight, R. L.; Kanlec, R. H.; Ohlendorf, H. M. **The use of treatment wetlands for petroleum industry effluents.** *Environmental Science & Technology*. 1999; 33 (7):973-980. ISSN: 0013-936X. This paper reviews treatment wetland performance for the removal of pollutants from petroleum industry wastewaters.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

- Kornilios, S.; Drakopoulos, P. G.; Dounas, C. **Pelagic tar, dissolved/dispersed petroleum hydrocarbons and plastic distribution in the Cretan Sea, Greece.** *Marine Pollution Bulletin*. 1998; 36 (12):989-993. ISSN: 0025-326X.
Floating tar, litter and seawater were sampled in July 1997 in the Cretan Sea. The mean pelagic tar concentration was more than two times higher than what was previously reported in the area, and is thought to be entering the Cretan Sea through the Ionian Sea.
- Krahn, M. M.; Stein, J. E. **Assessing exposure of marine biota and habitats to petroleum compounds.** *Analytical Chemistry*. March 1, 1998; 70 (5):A186-A192. ISSN: 0003-2700.
Sample questions that should be asked about a spill prior to establishing a sampling and analysis plan; a tiered analysis approach, and sampling quality assurance are discussed.
- Law, R. J.; Campbell, J. A. **The effects of oil and chemical spillages at sea.** *Journal of the Chartered Institution of Water and Environmental Management*. August 1998; 12 (4):245-249. ISSN: 0951-7359.
The grounding of the *Sea Empress* in Wales, and the loss of the *Braer* tanker in the Shetland islands are case studies used to explore damages caused by oil and chemical spillages.
- Lee, Choung Mook; Kang, Kwan Hyoung. **Prediction of oil boom performance in currents and waves.** *Spill Science & Technology Bulletin*. 1997; 4 (4):257-266. ISSN: 1353-2561.
This paper gives some helpful guidelines in making decisions on oil boom usage and type of deployment strategy for a given oil spill. Surface currents causing the entrainment failure for oil booms are investigated. Wave motion and its degradation effect on the oil booms is also discussed.
- Lin, Dong. **Water treatment complicates heavy oil production.** *Oil & Gas Journal*. September 20, 1999; 97 (38):76-78. ISSN: 0030-1388.
The Liaohe oil fields in China produce a significant amount of heavy oil. These oil fields do not provide an option for increasing water injection. Therefore, finding methods for treating this large water volume has been a complicating factor in producing heavy oil in this part of China.
- Longpre, Darcy; Jarry, Vincent; Fortin, Marie-Jose'. **Environmental impact sampling designs used to evaluate accidental spills.** *Spill Science & Technology Bulletin*. 1997; 4 (3):133-139. ISSN: 1353-2561.
Researchers studied recent literature to assess the effectiveness of various oil spill evaluation techniques and sampling designs.
- MacDonald, I. R. **Natural oil spills.** *Scientific American*. November 1998; 279 (5):56-61. ISSN: 0036-8733.
The article discusses the natural oil and gas discharges from the sea floor in the Gulf of Mexico. The characteristic shape and features of these natural oil slicks and the organisms that feed off the leaks are described. It is estimated that 40 million liters of oil flow naturally into the Gulf of Mexico every decade.
- Madany, I. M.; Jaffar, A.; Al-Shirbini, E. S. **Variations in the concentrations of aromatic petroleum hydrocarbons in Bahraini coastal waters during the period October 1993 to December 1995.** *Environment International*. 1998; 24 (1/2):61-66. ISSN: 0160-4120.
A chronic oil pollution problem was indicated after two years of testing (from October 1993 to December 1995) in the Arabian Gulf.
- Massoud, M. S.; Alabdali, F.; Alghadban, A. N. **The status of oil pollution in the Arabian Gulf by the end of 1993.** *Environment International*. January-February 1998; 24 (1/2):11-22. ISSN: 0160-4120.
- Matishov, G. G.; Zuev, A. N.; Shparkovskii, I. A. **Estimation of possible contamination of the Pechora Sea area coastal zone at the oil spill at the Prirazlomnoe oil field.** *Doklady Akademii Nauk*. 1999; 367 (5):702-704. ISSN: 0869-5652.
- Mezzomo, Roberto F. **Program advances oil recovery technology in Brazil.** *Oil & Gas Journal*. October 4, 1999; 97 (40):56-60. ISSN: 0003-1388.
Over a 5-year period, seven projects were undertaken to test different technologies for improving oil recovery from oil fields in Brazil. This program, know as 'PRAVAP' (Programa de Recuperação Avançada de Petróleo), produced 374 technical publications on a diversity of scientific and technical subjects, and played a decisive role in the economic feasibility of several exploration and production projects.
- Monastersky, R. **Do offshore wells fight natural pollution?** *Science News*. November 1999; 156:326. ISSN: 0036-8423.
Off the coast of Santa Barbara, California, oil seeps have been reported and documented as far back as the early Spanish explorers. Oil and gas companies have established 30-meter-wide steel tents on the seafloor to capture escaping gas and oil, therefore reducing the amount of hydrocarbons leaking out from the seafloor.
- Nakata, Kisaburo; Sugioka, Shin-Ichi; Hosaka, Takuji. **Hindcast of a Japan sea oil spill.** *Spill Science & Technology Bulletin*. 1997; 4 (4):219-229. ISSN: 1353-2561.

Nordvik, Atle. B. **Time window-of-opportunity strategies for oil spill planning and response.** *Pure and Applied Chemistry*. 1999; 71 (1):5-16. ISSN: 0033-4545.

This paper presents an integrated scientific and engineering strategy that provides policy to improve and implement decision-making for marine oil spills.

Nordvik, Atle B. **Summary of development and field testing of the Transrec oil recovery system.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):309-322. ISSN: 1353-2561.

Performance data collected for 11 years from the Transec oil recovery system was used to demonstrate the improvement of this oil recovery system and shortcomings of other systems.

Number of large oil spills decreases. *Marine Pollution Bulletin*. November 1997; 34 (11):853. ISSN: 0025-326X.

The International Tanker Owners Pollution Federation (ITOPF) released 1996 statistics that indicate fewer large oil spills, but a rise in actual oil spilt overall. The *Sea Empress* spill was the largest contributor to the increased quantity of oil spilt.

Obire, O.; Okudo, I.V. **Effect of crude oil pollution on a freshwater stream in Nigeria.** *Discovery and Innovation*. June 1997; 9 (1/2):25-32. ISSN: 1015-079X.

Office of Research and Development. US Geological Survey-Biological Resources Division.; (EPA) Gulf of Mexico Program. **State of Gulf of Mexico Estuaries.** *Marine Pollution Bulletin*. 2000; 40 (1):5-6. ISSN: 0025-326X.

This article is based on a published report entitled, *The Ecological Conditions of Estuaries in the Gulf of Mexico*. The report focuses and evaluates the Gulf estuaries in regard to benthic communities, sediment contaminants, low dissolved oxygen, commercial fish and shellfish landings, populations of waterfowl and other coastal birds and wetland loss issues.

Olagbende, O.T., et al. **Scientific and cleanup response to the IDOHO-QIT oil spill, Nigeria.** *Environmental Technology*. 1999; 20 (11):1213-1222. ISSN: 0959-3330.

On January 12, 1998, approximately 40,000 bbls of Qua Iboe light crude oil was spilled from a pipeline that ruptured from the IDOHO platform to the Mobil Qua Iboe terminal. This paper describes the fundamental constituents of the cleanup response and the elements and key findings of the short-term scientific response.

Oil and gas seepage from ocean floor reduced. *Sea Technology*. 2000; 41 (1):84. ISSN: 0093-3651. Over a 22 year period, studies of the area around Platform Holly, located in the Santa Barbara Channel, California showed a 50 percent decrease in seepage of naturally occurring, reactive, organic gases. This seepage was equal to twice the emission rate from all the on-road vehicle traffic in Santa Barbara County in 1990. According to researchers at the University of California, Santa Barbara, "worldwide decreases in natural hydrocarbon seepage related to onshore and offshore oil production may be causing a global reduction in natural methane emission rates".

Oil spill at Johor River heading for power station. *Marine Pollution Bulletin*. 1999; 38 (5):338. ISSN: 0025-326X.

The tanker *Bunga Cempaka 1*, which was undergoing repairs at a Malaysian shipyard, accidentally released 50 tons of oil. Port authorities, the Department of Environment, and Malaysian shipyard engineers worked continuously to contain the spill before it reached the nearby power station.

Pagano, S. S. **Deepwater offshore oil: where the action is.** *Sea Technology*. 1999; 40 (4):33-34. ISSN: 0093-3651.

The Gulf of Mexico is one of several expanding deepwater hot spots around the globe. Projected development activity in the Gulf of Mexico is expected to gather momentum when oil prices recover. However, Brazil remains one of the most active deepwater regions, particularly as the country invites foreign participation for exploration and field development joint ventures.

Page, David S., et al. **An estimate of the annual input of natural petroleum hydrocarbons to seafloor sediments in Prince William Sound, Alaska.** *Marine Pollution Bulletin*. September 1997; 34 (9):744-749. ISSN: 0025-386X.

Natural petroleum seepage is difficult to measure due to fluctuating seepage rates over time, and a lack of sufficient geographic sampling density over time. The minimum baseline for petroleum seepage in the area was estimated at 360-1200 tons per year.

Park, J. M.; Holliday, M. G. **Occupational-health aspects of marine oil-spill response.** *Pure and Applied Chemistry*. 1999; 71 (1):113-133. ISSN: 0033-4545.

Pelletier, E.; Siron, R. **Scilicone-based polymers as oil spill treatment agents.** *Environmental Toxicology and Chemistry*. 1999; 18 (5):813-818. ISSN: 0730-7268. The practical aspects of preparing and applying new silicone-based treating agents are described along with conditions for their possible use to mitigate the effects of oil spills.

- Pezeshki, S. R.; Hester, M. W.; Lin, Q.; Nyman, J. A. **The effects of oil spill and clean-up on dominant US Gulf coast marsh macrophytes: a review.** *Environmental Pollution*. 2000; 108 (2):129-139. ISSN: 0269-7491.
This review uses existing information in regard to the efficiency of using macrophytes for oil spill-response in coastal systems.
- Pipeline causes oil slick off California coast.** *Marine Pollution Bulletin*. November 1997; 34 (11):856. ISSN: 0025-326X.
An underwater pipe belonging to the Torch Operating Company, operating platform Irene for Nuevo Energy Company of Houston, TX, spilt approximately 10,000 gallons of oil near Santa Barbara, CA, in September.
- Price, A. R. G. **Impact of the 1991 Gulf War on the coastal environment and ecosystems: current status and future prospects.** *Environment International*. January-February 1998; 24 (1/2):91-96. ISSN: 0160-4120.
- Prince, R. C.; Vardara, R.; Fiocco, R. J.; Lessard, R. R. **Bioremediation as an oil spill response tool.** *Environmental Technology*. 1999; 30:891-896.
The optimal oil spill response is to collect the spilled oil rapidly, but this is rarely achieved after a major spill. Dispersants such as Corexit 9527 and Corexit 9500 not only remove floating slicks from the surface of the sea, but also enhance the biodegradation of the oil, removing it more rapidly from the environment. This modern paradigm of environmental engineering; working with nature, will achieve the desired response most effectively and expeditiously.
- Raghavan, P. U. M.; Vivekanandan, M. **Bioremediation of oil-spilled sites through seeding of naturally adapted *Pseudomonas putida*.** *International Biodeterioration & Biodegradation*. 1999; 44 (1):29-32. ISSN: 0964-8305.
- Randolph, R. C., et al. **Toxicity and persistence of nearshore sediment contamination following the 1991 Gulf War.** *Environment International*. January-February 1998; 24 (1/2):33-42. ISSN: 0160-4120.
- Rao, G. K. **Geo-hazard with oil and gas production in Krishna-Godavary basin.** *Current Science*. March 25, 1998; 74 (6):494. ISSN: 0011-3891.
- Reilly, T. J. **The use of mesocosms in marine oil spills ecological research and development.** *Pure and Applied Chemistry*. 1999; 71 (1):153-160. ISSN: 0033-4545.
Mesocosm systems provide an environment in which a controlled field study can be conducted and used to identify optimal response and clean-up strategies. While valuable for realism, the mesocosm system is expensive and often difficult to implement because of regulatory barriers.

- Richard, J. Y.; Vogel, T. M. **Characterization of a soil bacterial consortium capable of degrading diesel fuel.** *International Biodeterioration & Biodegradation*. 1999; 44 (2/3):93-100. ISSN: 0964-8305.
- Rye, H.; Brandvik, P. J.; Strøm, T. **Subsurface blowouts: results from field experiments.** *Spill Science & Technology Bulletin*. 1997; 4 (4):239-256. ISSN: 1353-2561.
Field experiments carried out in June of 1996 determined that the current field methodology used to study blowout releases appears to be appropriate. They also showed that surface oil slicks from subsurface releases are characteristically much wider and thinner than surface oil releases, and only 15-20% of the spill is evident on the surface.
- Salmon, David K. **Lessons in political oceanography part 1: A preliminary analysis of whether an oil spill off Cape Hinchinbrook, Alaska could (or would) directly impact the Copper River Delta.** *Spill Science & Technology Bulletin*. 1997; 4 (3):141-146. ISSN: 1353-2561.
The Cooper River Delta is located just east of Prince William Sound, and during eastward excursions of the Alaska coastal current it is subject to contamination of oil spills.
- Sauer, T. C.; Michel, J.; Hayes, M. O.; Aurand, D. V. **Hydrocarbon characterization and weathering of oiled intertidal sediments along the Saudi Arabian coast two years after the Gulf War oil spill.** *Environment International*. January-February 1998; 24 (1/2):43-60. ISSN: 0160-4120.
- Scott, P. J. B.; Davies, M. **Retroactive determination of industrial contaminants in tropical marine communities.** *Marine Pollution Bulletin*. November 1997; 34 (11):975-980. ISSN: 0025-326X.
Upon a request from oil companies, these researchers used a method of determining all heavy metal contaminants in coral skeletons. They found that each of the three sites they tested exhibited different metals in the coral, thus no predictions should be made about which metals will remain after a spill event.
- Shore, R. F.; et al. **Polycyclic aromatic hydrocarbon (PAH) residues in the eggs of coastal-nesting birds from Britain.** *Marine Pollution Bulletin*. 1999; 38 (6):509-513. ISSN: 0025-326X.
This current study presents results from field analysis and controlled experiment with background levels of PAH residues in egg and their embryotoxic effects on birds nesting in the coastal areas of Britain.
- Shriadah, Mohammed M. A. **Petroleum hydrocarbons along the Arabian Gulf coast of United Arab Emirates.** *Indian Journal of Marine Science*. 1999; 28 (1):10-16. ISSN: 0379-5136.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

- Shriadah, Mohammed M. A. **Impacts of oil spill on the marine environment of the United Arab Emirates along the Gulf of Oman.** *Marine Pollution Bulletin*. 1998; 36 (11):876-879. ISSN: 0025-326X. Objectives of this paper are to assess the marine environmental recovery after cleanup and evaluate the concentrations of petroleum hydrocarbons and organic carbon contents at the time of the March 31, 1994 tanker collision incident.
- Shriahah, Mohammed M. A. **Oil contamination along oil tanker routes off the United Arab Emirates (The Arabian Gulf and the Gulf of Oman).** *Bulletin of Environmental Contamination and Toxicology*. 1999; 63 (2):203-210. ISSN: 0007-4861. The present study is aimed at examining the current state of oil contamination in offshore areas and along oil tanker routes in the Arabian Gulf and the Gulf of Oman. It is estimated that 57.1% and 22% of total oil contamination in the Gulf has originated from tanker and offshore production contribution, respectively.
- Simoncic, M.; Ozim, V. **Purification of a contaminated thermal well at an oil drilling site.** *Environmental Toxicology*. 1999; 14 (2):211-216. ISSN: 1520-4181. A method is described for producing water suitable for bathing from thermal waters derived from former oil drilling sites that are contaminated with H₂S, organic compounds, and bacteria.
- Smith, D. L.; Proffitt, C. E. **The effects of crude oil and remediation burning on three clones of smooth cordgrass (*Spartina alterniflora* Loisel).** *Estuaries*. 1999; 22 (3A):616-623. This paper describes a fully crossed 6-month greenhouse experiment designed to assess the effects of Venezuelan crude oil alone; and oil followed by burning on three clonal genets of *Spartina alterniflora*.
- Taylor, C.; Viraraghavan, T. **A bench-scale investigation of land treatment of soil contaminated with diesel fuel.** *Chemosphere*. 1999; 39 (10):1583-1593. ISSN: 0045-6535.
- Tokyo Bay oil spill less than thought.** *Marine Pollution Bulletin*. August 1997; 34 (8):596. ISSN: 0025-326X. Fifteen hundred tons of crude oil was spilled from the *Diamond Grace* when it struck the Nakanose reef in Tokyo Bay. Although the oil spill was well contained, Japanese environmentalist are concerned with the bay, because of its enclosed body of water. Environmentalist anticipate damage to tidal flats and wildlife in the bay area.
- Unlu, K.; Demirekler, E. **Modeling water quality impacts of petroleum contaminated soils in a reservoir catchment.** *Rostlinna Vyroba*. 2000; 120 (1/2):169-193. ISSN: 0049-6979.
- US Minerals Management Service Gulf of Mexico OCS Region, New Orleans, LA. *Gulf-Wide Information System (GWIS), MMS 2000-027*. The Gulf-Wide Information system (GWIS) is a geographic database that provides a complete and consistent view of marine and coastal data for the entire study area, and can be used in oil-spill contingency planning, oil-spill response, and environmental planning and assessment in the marine and coastal areas.
- Ussenkov, S. M. **Contamination of harbor sediments in the eastern Gulf of Finland (Neva Bay), Baltic Sea.** *Oceanographic Literature Review*. June 1998; 45 (6):1019. ISSN: 0967-0653. The sediments contain very high concentrations of oil products and heavy metals.
- Vanden Belt, M.; Deutsch, L.; Jansson, A. **A consensus-based simulation model for management in the Patagonia Coastal Zone.** *Ecological Modelling*. July 1, 1998; 110 (1 Sp. Iss.):79-103. ISSN: 0304-3800. A scoping model, which includes simulated impacts of oil spills, was constructed to integrate ecological and economic aspects of coastal zone management of Patagonia.
- Veil, John A.; Daly, Joseph M.; Johnson, Nancy. **EPA speeds regs for offshore synthetic-based mud.** *Oil & Gas Journal*. September 13, 1999; 97 (37):78-84. ISSN: 0030-1388. SBM (synthetic-based mud), is a drilling fluid believed to be environmentally friendly for discharging. EPA recognizes that current regulations and permits inadequately address SBM discharge issues, and is willing to modify the offshore and coastal effluent limitation guidelines.
- Vidakovic-Cifrek, Z.; Tkalec, M.; Horvatic, J.; Regula, I. **Effects of oil industry high density brines in miniaturized algal growth bioassay and Lemna test.** *Phyton - Annales Rei Botanicae*. 1999; 39 (3):193-197. ISSN: 0079-2047.
- Vitis, D. D.; Nolan, K.; Schmidt, W. **Test and evaluation of four fire resistant booms at OHMSETT.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):345-347. ISSN: 1353-2561. Commercial fire booms were involved in burn testing to measure the oil collection/containment performance, ease of handling, and the sea keeping ability when subjected to a variety of towing and wave conditions.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

- Wang, Zhendi, et al. **Study of the 23-year old Nipisi oil spill: persistence of oil residues and comparisons between surface and subsurface sediments.** *Environmental Science & Technology*. 1998; 32 (15):2222-2232. ISSN: 0013-936X.
Evaluation of the Nipisi oil spill showed degradation of surface sample residual oil, great quantities of oil in the subsurface samples, and similar oil trends across the site, even where different treatments were used after the spill.
- Wattayakorn, G.; King, B.; Wolansi, E.; Suthanaruk. **Seasonal dispersion of petroleum contaminants in the Gulf of Thailand.** *Continental Shelf Research*. 1998; 18 (6):641-659. ISSN: 0278-4343.
During 1994 and 1995, the waters of the Gulf of Thailand circulated slowly, and the Gulf was poorly flushed. An oil spill model using the observed currents, dissolved, and dispersed petroleum hydrocarbons predicted that acute contamination occurs everywhere in the Gulf at least once a year.
- Wellman, D. E.; Reid, D. A.; Ulery, A. L. **Elevated soil arsenic level at a former crude oil storage facility- assessment, remediation, and possible sources.** *Journal of Soil contamination*. 1999; 8 (3):329-341. ISSN: 1058-8337.
- Williams, Bob. **Arco's Villano project: improvised solutions in Ecuador's rainforest.** *Oil & Gas Journal*. August 2, 1999; 97 (31):19-24. ISSN: 0030-1388.
ARCO's Villano flowline lies in a pristine area of rainforest in Ecuador. A improvised monorack system is designed to lessen environmental impact in the rainforest and to minimize the operation's 'footprint' on the remote rainforest escarpment.
- Yoshioka, G.; et al. **Past in situ burning possibilities.** *Spill Science & Technology Bulletin*. 2000; 5 (5/6):349-351. ISSN: 1353-2561.
The objective of this study is to evaluate the degree to which *in situ* burning can be used as an oil response technique. It also seeks to establish a criteria to assess whether a burn would have been successful and apply this criteria to the analysis of each of the past major oil spills.

A restaurant chain assists in lobster habitat restoration.

Marine Pollution Bulletin. 1999; 38 (4):237. ISSN: 0025-326X.

NOAA's Restoration Centre and the Red Lobster restaurant chain have joined forces in an attempt to restore the damaged marine lobster habitats around Rhode Island's Narragansett Bay. In 1989, the *World Prodigy* oil spill killed hundreds of adult lobsters as well as eggs and larvae. Money made available from the settlement of the oil spill will be used to fund the project.

API to target more independents as members. *Oil & Gas Journal*. January 26, 1998; 96 (4):38-41. ISSN: 0030-1388.

The American Petroleum Institute is trying to recruit small, independently owned oil companies to reflect the shift in today's oil industry trends.

API: U. S. petroleum statistics show a robust industry in 1997. *Oil & Gas Journal*. January 26, 1998; 96 (4):40. ISSN: 0030-1388.

U.S. oil consumption, supply side, fuel breakouts, and drilling statistics for 1997 are shown and discussed.

API: U. S. oil inventories at 3-year high. *Oil & Gas Journal*. December 22, 1997; 95 (51):25-26. ISSN: 0030-1388.

Deliveries of petroleum products to the U.S. market in November were up 1.8%, and crude oil stocks are up 8% from a year ago.

Aalund, L. R. Sizzling Qatar boom sparked by foreign money, technology, and gas. *Oil & Gas Journal*. April 27, 1998; 96 (17):33-43. ISSN: 0030-1388.

The article details the companies and rigs now active, or soon to be active, in Qatar on the Persian Gulf.

Alaskans grappling with dramatic change in state oil, gas industry looming with BP Amoco-Arco deal. *Oil & Gas Journal*. September 6, 1999; 97 (36):33-51. ISSN: 0030-1388.

The proposed acquisition of ARCO by BP Amoco is of utmost concern in Alaska. The combined companies will own almost three-fourths of the Trans-Alaska Pipeline System, as well as almost the entire North Slope production infrastructure.

Alliance lowers compression costs for U. K. southern gas field. *Oil & Gas Journal*. February 2, 1998; 96 (5):66. ISSN: 0030-1388.

Five vendors allied with British Petroleum to substantially reduce the cost of installing a compression platform in Cleeton field.

American Institute of Petroleum. International oil spill conference: improving environmental protection - progress, challenges, and responsibilities. Proceedings, Fort Lauderdale, April 1997.

American Institute of Petroleum Publication. 1997; 4651;1056. ISSN: 0967-0653.

The papers from the conference span on topics such as training and exercises, case studies, response, planning, technology, research and development, spill prevention and management.

BP Amoco strikes tentative deal in Alaska. *Oil & Gas Journal*. 1999; 97 (46):36. ISSN: 0030-1388.

In order to secure Alaska's approval of the BP Amoco takeover of ARCO; BP Amoco agreed to sell producing assets amounting to 175,000 bo/d of output, together with associated infrastructure, 620,000 acres of Alaskan exploration leases, and a 13% stake in the Trans Alaska Pipeline System.

Beck, R. J. Demand growth to continue for oil; resume for gas this year in the U.S. *Oil & Gas Journal*. January 26, 1998; 96 (4):57-75. ISSN: 0030-1388.

This article features statistics from the last 10 years on supply and demand, prices, production, consumption, exports and imports, rig activity, stocks and much more.

Beck, R. J.; Bell, L. OGJ 200 companies posted strong financial year in 1997. *Oil & Gas Journal*. Sept. 7, 1998; 96 (36):49-77. ISSN: 0030-1388.

1997 was the second straight strong financial year for companies on the OGJ200 list of publicly traded oil and gas producers. Rankings and production levels of each company are given.

Beck, R. J.; Radler, M. Government oil companies dominate OGJ100 list of production leaders outside U.S. *Oil & Gas Journal*. Sept. 7, 1998; 96 (36):78-87. ISSN: 0030-1388.

Financial rankings of the OGJ100 list of production leaders outside the U.S. are not possible since many government companies only report production and reserves. The list is organized by company headquarter regions.

Beck, R. J. OPEC discipline, inventory cuts key to oil prices in second half. *Oil & Gas Journal*. 1999; 97 (30):49-56. ISSN: 0030-1388.

By utilizing withdrawals from the excess inventories that accumulated during late 1997 and 1998, OPEC is achieving a balanced market for growth demand and demand for new production.

Beck, Robert. First quarter profits fall with oil prices. *Oil & Gas Journal*. 1998; 96 (28):36-37. ISSN: 0030-1388.

Total first quarter profits for 129 oil companies were down 43.4% from the first quarter profits last year. A detailed table is presented.

Beginning outlook for the Oil & Gas Industry. *Ocean News & Technology*. 2000; 6 (1):19. ISSN: 1082-6106.

A comprehensive survey of oil company exploration and production expenditures has been completed by the Lehman Brothers. The survey indicates that 320 oil and gas companies plan a meager, leading to 10.2% growth in their worldwide E&P expenditures in 2000. However, spending by major international oil companies declines compared to North America and Canada, who are planning an increase in spending of 22.5%.

Benton inks Senegal E&D MOU. *Oil & Gas Journal*.

December 22, 1997; 95 (51):27. ISSN: 0030-1388. Petrosen, a Senegal state-oil company, signed a memorandum of understanding (MOU) with Benton Oil & Gas Co. of Carpinteria, CA. Benton Oil now has operatorship and a 45% working interest in the These Block in northwestern Senegal.

Burden, Paul L. A.; Davies, Christopher P. N. **Oribi field is South Africa's first offshore crude oil production.** *Oil & Gas Journal*. September 15, 1997; 95 (37):63-65. ISSN: 0030-1388.

Production from the Oribi oil field, owned by Soekor E&P and Energy Africa Bredasdorp (Pty.) Ltd., began in early May 1997. It is expected that 18 million bbl of light crude oil will be recovered over a 4 year period.

Bottomley, Steven; Pritchard, Graham. **Tulenovo field holds key to new drilling in Bulgaria.** *Oil & Gas Journal*. March 2, 1998; 96 (9):110-114. ISSN: 0033-1388.

The Tulenovo oil field is located on the Black Sea coast 25 km south of the Romanian border. There is an estimated 69 million bbl of oil to be harvested. The MMS is looking for investors.

Bray, John. **Petroleum and human rights: the new frontiers of debate.** *Oil & Gas Journal*. 1999; 97 (44):56-69. ISSN: 0030-1388.

This article has three objectives. First, it analyzes the sources of pressure for change. Second, it discusses how companies can meet new challenges. Third, it identifies the most sensitive issues in the current international debate and describes the likely way to proceed.

Burns, R. F. **World's deepest water drilling/production platform.** *Sea Technology*. 1999; 40 (4):19-23. ISSN: 0093-3651.

Exxon has begun development of the Hoover and Diana fields 160 miles east of Corpus Christi, TX, in the Western Gulf of Mexico. This development is first of seven key worldwide deepwater discoveries announced in the last two years. The Hoover/Diana production facilities are designed to handle 100,000 barrels/day of crude and 325 million cubic feet/day of gas.

Cakerawala OK heads Malay-Thai action. *Oil & Gas Journal*. January 26, 1998; 96 (4):46. ISSN: 0030-1388.

Development of the first gas field in the Malay-Thai shared waters of the Gulf of Thailand has been approved. Production is scheduled to begin late in the year 2000.

Canada warns ships over illegal spills that kill thousands of seabirds. *Marine Pollution Bulletin*. September 1998; 36 (9):656-657. ISSN: 0025-326X.

Canadians report some 20,000-100,000 seabirds are dying from oiling. Analysis of the oil contamination shows that the samples consist mainly of fuel oils, lubricating and hydraulic oils, suggesting illegal discharging of machinery waste rather than crude oil tanker leaks.

Campbell, Colin J.; Laberrere, Jean H. **The end of cheap oil.** *Scientific American*. March 1998; 278 (3):78-83. ISSN: 0036-8733.

Oil production is expected to begin slowing down within the decade. Oil prices are expected to climb unless demand for oil tapers.

Champ, Michael A. **The history of the Japanese international oil spill symposia.** *Spill Science & Technology Bulletin*. 1997; 4 (4):Preface. ISSN: 1353-2561.

China accelerates shift in energy policy, restructuring of state petroleum firms. *Oil & Gas Journal*. 2000; 98 (2):14-18. ISSN: 0030-1388.

In the last few years China's energy policy has gone through major changes. The restructuring has led to a number of strategic changes in the country's oil and gas industry by raising funds for capital investment, cutting costs, and focusing on development of cleaner fuels.

Cross, Ian. **Several world regions still recovering from '98-'99 exploration slump.** *Oil & Gas Journal*. February 28, 2000; 98 (9):55-67. ISSN: 0030-1388.

This article focuses on exploration, completion of delineation wells; and contracts or concessions awarded to give an idea of 1999 world activity levels.

Crow, Patrick. **Alaskan issues.** *Oil & Gas Journal*. 1999; 97 (26):30. ISSN: 0030-1388.

Alaskans are facing a decision on how they will continue to pay for public services. The state's primary funding comes from oil royalties, but concurrent dips in oil prices and production has left the state with a considerable deficit. State officials are proposing to fund some state operations with monies accrued from the North Slope oil revenues.

Crow, Patrick. **Change in China.** *Oil & Gas Journal.* 1999; 97 (25):32. ISSN: 0030-1388.

CNPC and Sinopec, two of China's major oil employers, are planning to cut their workforces to 1 million by 2004 from 1.5 million in order to reduce cost and better compete in the global market.

Crow, Patrick. **Sanctions showdown.** *Oil & Gas Journal.* October 13, 1997; 95 (41):35-36. ISSN: 0030-1388.

Three international oil firms (France's Total, Russia's Gazprom, and Indonesia's Petronas) signed a contract with the Iranian National Oil Co. in 1997 that appears to violate the 1996 Iran-Libya Sanctions Act.

Crow, Patrick. **Colombia's prospects.** *Oil & Gas Journal.* December 22, 1997; 95 (51):26. ISSN: 0030-1388.

Colombia's oil and gas licensing terms have been revised, and revitalization in exploration and production is expected as a result.

Crow, Patrick. **Ukraine's woes.** *Oil & Gas Journal.* January 26, 1998; 96 (4):44. ISSN: 0030-1388.

Ukraine wants to increase its gas and condensate output, but they are having difficulty conforming to the practices of foreign oil companies.

Crow, Patrick. **Santa Fe Snyder makes another S. China Sea find.** *Oil & Gas Journal.* 1999; 97 (46):32. ISSN: 0030-1388.

Santa Fe Snyder Corporation has made a new oil discovery on Block 15/34 in the Pearl River Mouth basin in the South China Sea. Evaluations based on an appraisal well drilled in August 1999, confirmed an estimated 50 million bbl of crude oil could be recovered.

Data warehouse manages offshore project information. *Oil & Gas Journal.* May 4, 1998; 96 (18):94. ISSN: 0030-1388.

Norway's Asgard project data will be managed by a data warehouse adopted from the POSC/Caesar data model.

Davies, G. **Offshore Kazakhstan: Ultimate challenge for the oil industry.** *Marine Pollution Bulletin.* January 1998; 36 (1):7. ISSN: 0025-326X.

Due to challenges such as sulfur present in the strata surface operating conditions in Kazakhstan, and strict legislative regimes, the exploration and development in the Kazakh sector is best left to a consortium of international oil companies rather than individual ones.

DeBaie, B. **Resources base, pipeline networks position Canadian producers for greater share of U.S. oil and gas demand.** *Oil & Gas Journal.* 1999; 97 (26):34-53. ISSN: 0030-1388.

Outlined in this article are proposed oil and gas pipeline expansion and the relationship between Canadian producers and pipeline companies that are working together to keep Canada's resource basins competitive and ready to capitalize on market opportunities.

Deepwater Gulf of Mexico production rising. *Oil & Gas Journal.* 1999; 97 (44):34. ISSN: 0030-1388.

In 1998, production of oil and gas from the deepwater areas of the Gulf of Mexico reached an all-time high. The rising production from the deepwater's of the Gulf of Mexico has great momentum and will continue to play a key role in our national energy strategy.

Deepwater plans for 2000. *Ocean News & Technology.* 2000; 6 (1):20. ISSN: 1082-6106.

According to Offshore Data Services' *Gulf of Mexico Newsletter*, December 27, 1999, US Gulf of Mexico operators have filed plans to drill 44 wells in water depths greater than 1,500 feet, with seven planned for ultra-deepwater of greater than 7,500 feet.

Deis, D. R.; French, D. P. **The use of methods for injury determination and quantification from natural resource damage assessment in ecological risk assessment.** *Human and Ecological Risk Assessment.* August 1998; 4 (4 Part 2):887-903. ISSN: 1080-7039.

Natural resource damage assessment regulations and procedures are used to identify and quantify natural resource injury, determine damages resulting from the injury, and develop restoration actions. Pre-spill planning is emphasized.

Demirmen, Ferruh. **Despite recent gains in momentum, prospects for the Baku-Ceyhan Caspian oil export line remain doubtful.** *Oil & Gas Journal.* 1999; 97 (46):23-28. ISSN: 0030-1388.

In fall of 1999, an unconfirmed press report stated that BP Amoco had announced it would back the Baku-Ceyhan pipeline, after opposing it consistently since 1995. BP Amoco's announcement notwithstanding the fundamentals of the Baku-Ceyhan dispute has not changed, and there is no guarantee that the project will materialize.

Dion, R. R. **Long view of Caspian oil export options tilts to Kazakhstan-China.** *Oil & Gas Journal.* 1999; 97 (23):21-28. ISSN: 0030-1388.

Political litigation has been a long-term problem with the Caspian oil pipeline. Utilizing Kazakhstan's territory for a future pipeline would have a huge advantage, because it is largely a one-man state able to dictate activities related to the development of the routes.

- Dion, R. R. **Petroleum companies must fight corruption; instill responsibility in evolution of social awareness.** *Oil & Gas Journal*. February 21, 2000; 98 (8):21-25. ISSN: 0030-1388.
Over the last 30 years the social awareness in which oil companies conduct their business has been dramatically transformed. The industry has become more receptive to the needs of the countries in which they operate.
- Ducrotoy, Jean-Paul; Elliott, Michael. **Interrelations between science and policy-making: the North Sea example.** *Marine Pollution Bulletin*. September 1997; 34 (9):686-701. ISSN: 0025-386X.
Protection of the North Atlantic now falls under OSPARCOM (Oslo and Paris Commission). There is now a greater possibility of overlap of the efforts of OSPARCOM and the increasing EU (European Union). The article discusses the impact of the possible new international legislation from a scientific research standpoint.
- Edwards, J. D. **Crude oil and alternate energy production forecasts for the twenty-first century: The end of the hydrocarbon era.** *AAPG Bulletin - American Association of Petroleum Geologists*. August 1997; 81 (8):1292-1305. ISSN: 0149-1423.
World oil production rates, and alternate energy source, predictions are made through the year 2100.
- Edwards, R. **The Sea Empress oil spill.** *Oceanographic Literature Review*. May 1998; 45 (5):826. ISSN: 0967-0653.
- Emerson, Sarah. **Recent oil price trends underscore OPEC's unwieldy market power.** *Oil & Gas Journal*. 2000; 98 (24):89-90. ISSN: 0030-1388.
With the Asian economic crisis unfolding at the end of 1997, and OPEC raising production, some industry observers claim that OPEC was out of touch, if not moribund. Traditionally, OPEC's production policies have been discussed in terms of the trade-off between maximizing price or maximizing market share. This dichotomy, however, provides only a simple framework, which is misleading in its characterization of OPEC's alternatives. The member states of OPEC are well aware of their dependence on steady oil consumption. Moreover, they know that high prices encourage investment in non-OPEC countries.
- ExxonMobil sells properties, organizes.** *Oil & Gas Journal*. 1999; 97 (51):26-29. ISSN: 0030-1388.
ExxonMobil Corporation and BP Amoco have agreed to dissolve their European fuels and lubricants joint venture and split the assets in line with their equity stakes.
- Febvre, A. **Oil spills research funded.** *Marine Pollution Bulletin*. September 1997; 34 (9):682-683. ISSN: 0025-326X.
The European Union (EU) will fund a two year project aimed at developing oil spill detection and monitoring in the Mediterranean and south-west Atlantic coast with the purpose of studying the feasibility of an early warning system for oil spills.
- Fouda, Safaa A. **Liquid fuels from natural gas.** *Scientific American*. March 1998; 278 (3):92-95. ISSN: 0036-8733.
Diesel and other fuels are now being produced using natural gas, a more plentiful and cleaner energy source than oil.
- Four operators get set for Falklands drilling.** *Oil & Gas Journal*. February 23, 1998; 96 (8):30-32. ISSN: 0030-1388.
In May 1998, four drilling rig operators will begin jointly drilling five wildcat wells off the Falkland Islands, each sharing the cost of mobilizing the drilling rig to the Falkland Islands.
- Gaddy, Dean E. **Pioneering work, economic factors provide insights into Russian drilling technology.** *Oil & Gas Journal*. July 6, 1998; 96 (27):67-69. ISSN: 0300-1388.
Russian achievements in horizontal and multilateral drilling technologies are examined along with a discussion on the economic differences, which directed Russian and American research.
- Gaddy, Dean E. **Rig activity drops as oil prices decline.** *Oil & Gas Journal*. Sept. 21, 1998; 96 (38):49-59. ISSN: 0030-1388.
The number of rigs worldwide for oil and gas drilling dropped 19% over the last year to 1,764 as a result of a decline in oil prices.
- Gaddy, Dean E. **Fresh opportunities arise in Russia as country's oil majors respond to lessons learned from the 1990s.** *Oil & Gas Journal*. February 28, 2000; 98 (9):23-26. ISSN: 0030-1388.
- Gaddy, Dean E. **Rig clubs help alleviates Caspian Sea drilling shortage.** *Oil & Gas Journal*. 1999; 97 (45):63-67. ISSN: 0030-1388.
Several international consortia in the Caspian Sea have formed rig-sharing groups. This will provide a means to fulfill production-sharing obligations with a limited number of mobile offshore drilling units.
- Gaddy, Dean E. **Russian oil major Yudos implements wester-style reorganizatoin.** *Oil & Gas Journal*. 1999; 97 (24):21-26. ISSN: 0030-1388.
An aggressive two-part reorganization plan by Russia's Yukos Oil Co. is being implemented. By reducing costs and improving operation efficiencies, Yukos Oil Co., is determined to become a world-class oil company.

Ganten, R. H. **HNS and oil pollution developments in the field of compensation for damage to the marine environment.** *Oceanographic Literature Review*. 1998; 45 (2):394. ISSN: 0967-0653.

The 'International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea' (HNS Convention) was compared to recent amendments in oil pollution protocols.

Gay, Joel **Crude behavior.** *National Fisherman*. 1998; 79 (3):20-21. ISSN: 0027-9250.

Exxon called for a mistrial of the 1995 case against them in which they were ordered to pay \$5 billion in punitive damages on the grounds of jury tampering. A decision on the call for a new trial will be made this summer, and if denied, Exxon's appeals will be bundled into one hearing later in the fall.

Gibbs, Barry. **Offshore structure abandonment: solutions for an aging industry.** *Sea Technology*. 2000; 41 (4):25-32. ISSN: 0093-3651.

The National Fishing Enhancement Act of 1984 and the Texas Artificial Reef Act of 1989 provide a program for oil companies to donate their in place, decommissioned oil structures to the TPWD Artificial Reef Program (TARP). The TARP program is able to maintain the abandoned structures with funds that would have been used to clean and remove the platforms. These structures provide a natural marine habitat.

Goldstein, Lawrence J. **Risks to global crude oil flow sustain need for strategic reserve.** *Oil & Gas Journal*. September 15, 1997; 95 (37):20-24. ISSN: 0030-1388.

The Strategic Petroleum Reserve (SPR) level is in danger of being reduced by a number of proposed bills. The paper discusses the effects reduction of SPR levels would have on transit risks, prices, sanctions issues, draw down, sales and other uses.

Grau, M. V.; Groves, T. **The oil spill process: the effect of coast guard monitoring on oil spills.** *Oceanographic Literature Review*. June 1998; 45 (6):1038. ISSN: 0967-0653.

Coast Guard enforcement efforts work to decrease both the frequency and size of oil spills. Impending fines have no effect on oil spill size, and few spills from non-monitored transfers are detected.

Gray, Glenn. **Alaska finds consistency effective in managing oil and gas development.** *Coastal Services*. May/June 2000; 3 (3):2-3.

This article provides an overview of the Northstar oil development project scheduled to begin in 2001. It also provides a socioeconomic evaluation of the development of Alaska over the past 30 years and shows how the State has been directly tied to oil development.

Greenberg, Jerry. **Turnkey management allows operators to manage drilling risk.** *Oil & Gas Journal*. Sept. 21, 1998; 96 (38):60-66. ISSN: 0030-1388.

Drilling management contractor services may one day be useful for complete field development programs. Case studies and efficiency measures are given.

Gregoli, M. K.; Brett, J. F.; Gahan, B. C. **Drilling industry benefits by sharing successful drilling practices.** *Oil & Gas Journal*. Sept. 28, 1998; 96 (39):85-89. ISSN: 0030-1388.

Successful drilling practices consist of aggregated, small-scale tasks that serve to improve overall drilling processes.

Grigalunas, T. A.; Opaluch, J. J.; Diamantides, J.; Mazzotta, M. **Liability for oil spill damages: issues, methods, and examples.** *Coastal Management*. April-June 1998; 26 (2):61-77. ISSN: 0892-0753.

FTC finally clears Exxon-Mobil merger. *Oil & Gas Journal*. 1999; 97 (49):30-31. ISSN: 0030-1388.

The US Federal Trade Commission has finally allowed Exxon Corporation to acquire Mobil Corporation, but they will require the firms to shed many assets.

Harris, P. M. **Amoco saves \$31 million in deepwater drilling operations.** *Oil & Gas Journal*. May 4, 1998; 96 (18):65-74. ISSN: 0030-1388.

The article reviews offshore drilling expansions in the Gulf of Mexico and the North Sea.

Hiney, J. **There's oil down there...way down there.** *Texas Shores*. Spring 1998; 31 (1):2-25. ISSN: 0747-0959.

The article discusses the current trends, technology, economic feasibility and drilling sites for harvesting deepwater oil reserves.

Hoskins, B.; Ram, N. M.; Patrick, P.; Cawley, J. M. **Variation in the use of risk-based groundwater clean-up levels at petroleum release sites in the United States.** *Human and Ecological Risk Assessment*. September 1997; 3 (4):521-535. ISSN: 1080-7039.

State regulations governing assessment and clean up of petroleum release sites were examined between November and December 1996. Six categories of risk-based corrective action (RBCA) were identified. Regulation source documents from each state are listed.

Huge fine for oil spillers. *Marine Pollution Bulletin*. January 1998; 36 (1):4. ISSN: 0025-326X.

The captains of the tug, *Scandia*, and the president of Ekl Marine Corporation of New York were fined three million dollars for the January 1996 oil spill in Provincetown. This is the second largest criminal fine issued for an oil spill.

Ireland offers oil discovery, frontier blocks for bidding. *Oil & Gas Journal*. October 13, 1997; 95 (41):37. ISSN: 0030-1388.

Ireland's Department of Marine and Natural Resources is offering for bid, leases in Seven Heads and frontier acreage in the South Porcupine basin. Companies have until April 8, 1998 to submit applications for a lease in Seven Heads and until December 15, 1998 for bids on South Porcupine basin.

Jian, Sanqiang. **Multinational oil companies and the Spratly dispute.** *Oceanographic Literature Review*. 1998; 45 (2):394. ISSN: 0967-0653.

This article analyzes the issue focusing on the impact of multinational oil companies on the national policies of the littoral countries and on the territorial dispute in the South China Sea.

Jones, C. A. **Compensation for natural resource damages from oil spills: a comparison of US law and international conventions.** *International Journal of Environment and Pollution*. 1999; 11 (1):86-107. ISSN: 0957-4352.

The focus of this paper is on measuring natural resource damages from oil spills. The Oil Pollution Act (OPA) of 1990 (USA) is compared with the 1969 Act for International Convention on Civil Liability for Oil Pollution Damage and the 1971 Act for International Funds for Compensation for Oil Pollution Damage.

Kasprzak, R. A. **Use of oil and gas platforms as habitat in Louisiana's artificial reef program.** *Gulf of Mexico Science*. 1998; 16 (1):37-45.

In 1986, the Louisiana Fishing Enhancement Act was signed into law creating the Louisiana Artificial Reef Program. This program was designed to take advantage of fishing habitat opportunities offered by obsolete platforms. Federal regulations require that these structures be removed within 1 yr after the mineral lease is terminated. Disposal of abandoned offshore structures is not only a financial liability for the oil industry, but can also result in a loss of productive marine habitats.

Kelly, S. J. **Canadian heavy crude production seen rebounding early next decade.** *Oil & Gas Journal*. 1999; 97 (26):17-24. ISSN: 0030-1388.

As a result of fallout from the Asian financial crisis and a resulting decrease in petroleum demand and low oil prices, the Canadian heavy crude oil sector has suffered this past year. However, due to decline of indigenous oil production in the Rocky Mountain states, a growing dependence on Canadian crude is forecasted.

Khartukov, Eugene M. **Low oil prices, economic woes threaten Russian oil exports.** *Oil & Gas Journal*. 1998; 96 (23):25-30. ISSN: 0030-1388.
Russian oil profit margins plunge as their oil production and exportation rises exponentially.

Khurana, S. **Patents protect deepwater platform concepts.** *Oil & Gas Journal*. June 22, 1998; 96 (25):59-61. ISSN: 0030-1388.

The author discusses existing deepwater platform patents and encourages building on to existing patents and coming up with new patent ideas to reduce the cost of drilling.

Knight, Roger; Westwood, John. **Long-term prospects very bright for deep waters off West Africa.** *Oil & Gas Journal*. January 18, 1999; 97 (3):33-38. ISSN: 0030-1388.

Reserve estimates for West African fields are given.

Knott, David. **North Sea reserves life pegged at 25 years.** *Oil & Gas Journal*. September 15, 1997; 95 (37):26. ISSN: 0030-1388.

North Sea gas production is expected to rise.

Knott, David. **Huge potential seen in Europe's offshore frontiers.** *Oil & Gas Journal*. September 15, 1997; 95 (37):26. ISSN: 0030-1388.

At the Offshore Northern Europe conference in Aberdeen, the Atlantic margin's Barents Sea was spotlighted for its huge gas producing potential.

Knott, David. **Solar campaign at oil show.** *Oil & Gas Journal*. September 15, 1997; 95 (37):27. ISSN: 0030-1388.

Greenpeace had a booth promoting solar energy at the Offshore Northern Europe oil and gas conference in September.

Knott, David. **OPEC's weak ray of hope.** *Oil & Gas Journal*. January 26, 1998; 96 (4):41. ISSN: 0030-1388.

As a result of falling oil prices, OPEC is reconsidering the high production quotas they set in November.

Knott, David. **Mongolia re-joins oil producing world.** *Oil & Gas Journal*. February 23, 1998; 96 (8):33. ISSN: 0030-1388.

SOCO International of London has begun oil production operations in Mongolia for the first time in over 30 years.

Knott, David. **Climate changes issue a litmus test for oil company survival.** *Oil & Gas Journal*. 1999; 97 (50):27-29. ISSN: 0030-1388.

Looking toward the new millennium, most petroleum companies have made tremendous improvements in the environmental performance of their operations. Yet it is already possible to identify those companies that are in danger of extinction and those that have begun to evolve in response to this latest environmental challenge.

Knott, David. **Long-term stability of crude oil prices debated.** *Oil & Gas Journal*. 1999; 97 (48):25. During the first International Oil Summit held in Paris, November 16, 1999 and organized by Institut Francaise du Petrole, discussion over long-term oil price stability fueled debate. It could not be said if compliance with the current agreements will continue until its scheduled expiration, or if there will be a meeting to formulate policy.

Knott, David. **California-Texas crude oil line future in doubt.** *Oil & Gas Journal*. 1999; 97 (48):27. ISSN: 0030-1388. Plains All American Pipeline LP is taking preliminary steps to shut down its California-to-Texas crude oil pipeline. The pipeline designed to handle 300,000 b/d of crude, has been operating at much lower throughput rates. As a result, the pipeline has been little more than a financial drain on its owners since it was first filled in 1987. Plains has said that if no other shippers step forward to supply the line fill, it will consider other uses for the pipeline, such as shipping refined products or laying fiber optic cables.

Knott, David. **BP Amoco-ARCO merger hits snags in Alaska; concessions required.** *Oil & Gas Journal*. 1999; 97 (44):27-32. ISSN: 0030-1388. Greenpeace, an environmental campaign group, and a number of Inupiat activists from Alaska's North Slope area, have filed a lawsuit in the United States, in a bid to prevent BP Amoco from building a drilling and production facility 6 miles off the coast of Alaska. Inupiat activists and Greenpeace claim that the Northstar project lacks an adequate oil-spill plan and jeopardizes the fragile marine and coastal environment of the Arctic.

Labelle, Robert P.; Danenberger, Elmer P. **Oil-spill research program of the US Minerals Management Service.** *Spill Science & Technology Bulletin*. 1998; 4 (2):107-111. ISSN: 1353-2561. The MMS encourages technology development in areas of *in situ* burning, large wave-tank testing of spill countermeasures, remote sensing and oil-spill trajectory analysis.

Large fine for oil polluter. *Marine Pollution Bulletin*. November 1997; 34 (11):853. ISSN: 0025-326X. Twenty metric tons of crude oil was spilled by the Norwegian tanker, *Tove Knutsen* at the entrance to the Humber River near Grimsby in January 1997. 250 birds from the nearby Tetney Nature Reserve were oiled.

Lennox, R. **Implications of oil spills.** *Dock and Harbour Authority*. 1998; 78:882-883. ISSN: 0012-4419 The United Kingdom's Marine Pollution Control Unit Maintains the country's contingency plan for oil spills. It also directs offshore operations during a major spill and helps to co-ordinate shoreline spill response activities.

Lennox, R. **Implications of oil spill.** *Dock and Harbour Authority*. 1998; 78 (882-883):241-243. ISSN: 0012-4419

Linden, H. R. **Flaws seen in resource models behind crisis forecasts for oil supply, price.** *Oil & Gas Journal*. December 28, 1998; 96 (52):33-68. ISSN: 0030-1388. Charts of estimated proved reserves and oil production broken down by country are presented.

MMS to alter valuation of oil on Indian lands. *Oil & Gas Journal*. February 23, 1998; 96 (8):37. ISSN: 0030-1388. The proposed new rule for setting the value of oil produced on Indian lands will use the highest of three measures: Nynex futures prices, the lessee's gross proceeds, or an MMS-calculated major portion value.

Macary, S.; El-Haddad, A. **Decision trees optimize workover program.** *Oil & Gas Journal*. December 21, 1998; 96 (51):93-97. ISSN: 0030-1388. Risk-assessment techniques can be used to minimize risks associated with workovers. Operations in Egypt's largest oil producing field, the October Field, were evaluated.

Martin, Tim W. **Global refining addresses increased oil demands, new challenges.** *Oil & Gas Journal*. March 16, 1998; 96 (11):51-58. ISSN: 0030-1388. The article discusses global and U.S. asset rationalization and supply and demand. There are also production summaries for various countries.

Martinez, A. R.; McMichael, C. L. **Petroleum reserves: new definitions by the Society of Petroleum Engineers and the World Petroleum Congress.** *Journal of Petroleum Geology*. 1999; 22 (2):133-140. ISSN: 0141-6421.

McCabe, P. J. **Energy resources-Cornucopia or empty barrel?** *AAPG Bulletin-American Association of Petroleum Geologists*. November 1998; 82 (11):2110-2134. ISSN: 0149-1323.

McInnes, R. G. **Oil pollution - the local authority response in England and Wales.** *Proceedings - ICE: Municipal Engineer.* 1998; 127 (1):6-12. ISSN: 0965-0903.

This is one paper in a series of topic reports provided to the Technical Advisory Group Coastal Management Committee for the assistance of organizations involved in coastal work.

Melancon, J. Michael. **Oil and gas activity in the Gulf of Mexico federal OCS: 1990-1998.** *Sea Technology.* 1999; 40 (8):37-42. ISSN: 0093-3651.

This paper presents a statistical analysis of several activities and forecast daily oil and gas production projections through the year 2003.

Mooers, Christopher N. K. **South Florida Oil Spill Research Center.** *Spill Science & Technology.* 1997; 4 (1):35-44. ISSN: 1353-2561.

The South Florida Oil Spill Research Center, operated by the University of Miami, currently has three projects: the Straits of Florida Nowcast/Forecast System (SFNFS), Oil Spill Information Management System (OSIMS), and National Marine Oil Transportation System (NMOTSM). The SFNFS is described in this paper.

Newell, E. P. **Canada's oilsands industry comes of age.** *Oil & Gas Journal.* 1999; 97 (26):44-53. ISSN: 0030-1388.

Canada's oilsands resource is spread across 77,000 sq. km and with current technologies and processes, about 300 billion bbls are considered recoverable. This puts Canada's oilsands resources on par with Saudi Arabia's provided oil reserves which makes it one of the largest hydrocarbon deposits in the world.

Oceaneering awarded MOPU Contract. *Sea Technology.* 2000; 41 (1):85. ISSN: 0093-3651.

Oceaneering International Inc. recently announced their three-year award contract, at a day rate service arrangement, to provide mobile offshore production unit (MOPU) for development of the Legendre North and South oil fields on the North West Shelf of Western Australia. Oceaneering expects to increase annual earnings by \$0.30 per share during this primary contract term. The company is excited with the exposure and the opportunity to serve Australian operations in mobile production, subsea tieback, and conventional support services.

Offshore environmental concerns mitigated by onshore-based, extended-reach drilling. *Oil & Gas Journal.* May 4, 1998; 96 (18):118-120. ISSN: 0300-1388.

By using extended-reach drilling from near an onshore, pre-existing facility to tap into distant, offshore drilling targets, fewer new platforms may need to be erected, and the risk of offshore spills may decline.

Oil and hope for Chad. *Oil & Gas Journal.* 2000; 98 (24):25. ISSN: 0030-1388.

The World Banks' role in the Chad-Cameroon oil-development and pipeline project is to provide loans to two countries' governments and to the joint-venture pipeline companies. By financing the governments' equity stakes, the World Bank gains political influence unattainable by the private companies and important to the disposition of the state share of project proceeds.

Oil piracy poses growing menace to tanker traffic in South China Sea. *Oil & Gas Journal.* October 16, 1999; 97 (42):23-25. ISSN: 0030-1388.

Oil piracy in the South China Sea is a growing crisis for Maritime officials. These attacks are very violent toward the crewmen, which in most cases leaves the vessel unmanned and could lead to an environmental catastrophe and human loss.

Oil price management: Why OPEC needs a real gulf crude market. *Oil & Gas Journal.* 2000; 98 (24):92-98. ISSN: 0030-1388.

Over the past 4 years, oil prices have lurched from crisis to crisis in a boom-and-bust cycle that is a direct result of OPEC's failure to react promptly to clear market signals. OPEC finally seems to have realized that it needs to find a more effective way to manage the oil market if it is to achieve its price objectives.

Oliver, P. **Environmental assessment for oil and gas projects.** *Marine Pollution Bulletin.* 1998; 36 (4):177-180. ISSN: 0025-326X.

Mandatory environmental statements for Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1998 will go into effect for certain proposed oil and gas projects on the United Kingdom Continental Shelf. Statements will allow the Secretary of State for Trade and Industry to consider the environmental issues affecting projects when deciding whether or not to authorize them.

Ornitz, B. **Transport of oil at the crossroads: a legal perspective.** *Spill Science & Technology Bulletin.* 1999; 5 (2):103-107. ISSN: 1353-2561.

This article deals with several issues regarding unfettered freedom of United States and International shipping communities as the millennium approaches.

Pagano, S. S. **Offshore oil & gas: 'sweeping optimism'.** *Sea Technology.* January 1998; 39 (1):14-17. ISSN: 0093-3651.

1997 was a year of high yields, high profits and good exploration. The offshore rig market made a strong recovery, and the trend is expected to continue.

- Pagano, S. S. **Deep water plays: where the action remains.** *Sea Technology*. April 1998; 39 (4):10-16. ISSN: 0093-3651.
Despite dropping oil prices, new rig orders are very active. More than 60 new rigs are deep water capable, and orders are up for semi submersibles, jackups, and more ships for the drill fleet.
- Park, J. M.; Holliday, M. G. **Occupational-health aspects of marine oil-spill response.** *Pure and Applied Chemistry*. 1999; 71 (1):113-133. ISSN: 0033-4545.
Concern about health and safety is a normal part of every oil spill. In general, safety is easier to understand and address than are concerns about exposure to crude oil and other chemicals, which might be used in the response. This paper addresses chemical aspects of occupational health and marine oil-spill response and is restricted to exposures to crude oil in its various forms.
- Pearce, Jack B. **A short history of marine environmental monitoring.** *Marine Pollution Bulletin*. 1998; 37 (1/2):1-2. ISSN: 0025-326X.
A short bibliography is provided that may be useful for historical water quality assessment.
- Pettingill, Henry S. **Turbidite plays' immaturity means big potential remains.** *Oil & Gas Journal*. Oct. 5, 1998; 96 (40):106-112. ISSN: 0030-1388.
Deepwater drilling of turbidite plays offers significant untapped resources.
- Petzet, G. Alan.; Beck, R. J. **Dip in drilling likely for the U.S., Canada in 1998.** *Oil & Gas Journal*. January 26, 1998; 96 (4):80-81. ISSN: 0030-1388.
The article cites sufficient supplies of crude oil worldwide, weakening oil and gas prices, Southeast Asian economics, and the fact that 1997 was a record drilling year for Canada, as reasons for the predicted dip in 1998 drilling.
- Petzet, G. Alan. **Seismic, other sound at issue in deepwater Gulf of Mexico.** *Oil & Gas Journal*. September 13, 1999; 97 (37):105-106. ISSN: 0030-1388.
As exploration ventures into the deepwater's of the Gulf of Mexico, pressure has mounted with recognition that sound levels in the ocean may have increased dramatically, and may be causing harm to marine life. Currently MMS has little scientific data relating to disturbances of such marine mammals. In the next few years data will likely become available and emphasis will mainly focus on mitigating the effects, if any, of industrial sound on sea life.

- Pipeline will move Siberian crude oil to China.** *Oil & Gas Journal*. 2000; 98 (24):75. ISSN: 0030-1388.
Earlier this year, government officials from Russia and China signed an agreement to begin construction in 2003 of the \$1.7 billion crude oil pipeline that will stretch 2,330 km from Angarsk, to Mongolia, and then into Beijing. Oil analysts have praised the Russia-China pipeline project because Russia has long needed additional export routes and China is a fast-growing market.
- Poruban, Steven. **Ocean Energy, Seagull tout merger benefits.** *Oil & Gas Journal*. December 28, 1998; 96 (52):26-27. ISSN: 0030-1388.
Ocean Energy Inc. and Seagull Energy Corp., both of Houston, TX, have merged in order to combat low oil and gas prices. The company's drilling and production activities are outlined.
- Radler, Marilyn. **Worldwide construction.** *Oil & Gas Journal*. Oct. 5, 1998; 96 (40):63-103. ISSN: 0030-1388.
Major construction projects are listed by processing and pipeline categories.
- Rhodes, Anne. **Vastar uses technology, strategy to compete with majors in deep water.** *Oil & Gas Journal*. December 7, 1998; 96 (49):27-33. ISSN: 0030-1388.
Vastar Resources, Inc., an independent Houston-based oil firm, is using state-of-the-art seismic interpretation tools and creative partnership arrangements to compete with major oil firms for deepwater wells in the Gulf of Mexico.
- Rhodes, Anne. **Year 2000 glitch presents problem of unprecedented scope for petroleum industry.** *Oil & Gas Journal*. Sept. 28, 1998; 96 (39):29-36. ISSN: 0030-1388.
Companies are preparing their software portfolios, operational control systems and facilities for problems associated with the year 2000 date change. The article discusses the immense resource drain being placed on oil companies.
- Roberts, Rebecca B. **Surge in gulf gas will impact Louisiana facilities.** *Oil & Gas Journal*. August 18, 1997; 95 (33):45-47. ISSN: 0030-1388.
As deepwater developments come online in the Gulf of Mexico, gas production is expected to increase in a range of 3-9 bcf/d by 2005.
- Roland, K. **Technology will continue to profoundly affect energy industry.** *Oil & Gas Journal*. March 30, 1998; 96 (13):69-74. ISSN: 0030-1388.
The time, money, and effort required obtaining and paying for an energy source is constantly shrinking with developing technologies.

SOCIOECONOMIC/REGULATION/GENERAL

Roland, K. **Perceptions of future, often flawed, shape plans and policies.** *Oil & Gas Journal*. February 23, 1998; 96 (8):56-61. ISSN: 0030-1388.

This is a Norwegian perspective of the international oil industry and the factors that influence its future.

Russia to see its first merger of oil majors. *Oil & Gas Journal*. January 26, 1998; 96 (4):42-44. ISSN: 0030-1388.

Yukos Oil Corp. and Siberian Oil Co. (Sibneft) are merging to form Yuksi, representing the largest oil reserves holdings and the third highest oil production of any non-state oil company.

Santos expands Indonesian holdings. *Oil & Gas Journal*. December 22, 1997; 95 (51):27. ISSN: 0030-1388. Pertamina, a state-owned oil company, awarded Santo Ltd. of Adelaide, 45% interest in a production-sharing contract off Surabaya, Indonesia.

Sayre, Alan. **Oil boom, buyout fever fed Louisiana's economy in '97.** *The Courier*, (Houma, LA). Thursday, January 1, 1998; 120 (1):1B. Approximately 25,000 more non-farm jobs exist in Louisiana now in comparison with a year ago. Many of the workers formerly employed bought-out manufacturing plants and are being retrained for work offshore or along the coast in the oil and gas industries.

Schmoker, James W.; Dyman, Thaddeus S. **How perceptions have changed of world oil, gas resources.** *Oil & Gas Journal*. February 23, 1998; 96 (8):77-80. ISSN: 0030-1388.

The perception of both oil and gas reserves are constantly being adjusted upward. Future reserve growth of discovered oil and gas fields is always being underassessed.

Sea Empress Report Published. *Marine Pollution Bulletin*. September 1997; 34 (9):682. ISSN: 0025-326X. The Marine Accident Investigation Branch (MAIB) published its report fifteen months after the oil tanker *Sea Empress* released ~72,000 tons of crude oil into Milford Haven Harbor in south Wales. It is suspected that a lack of understanding of tidal stream information and having the salvage operation conducted 'by committee' were important factors compounding the accident. Milford Haven Port Authority and the Milford Harbor Master are being held responsible.

Sea Technology Staff. **Offshore: dramatic recovery key to ocean markets comeback.** *Sea Technology*. 41 (4):10-14. ISSN: 0093-3651.

Dramatic recovery of the oil and gas industry during the past year is an indicator of the committed oil companies around the world. Deepwater drilling and production remains the focus of these players in the Gulf of Mexico and in international regions as oil & gas markets improve.

Shell okays field development of Nigeria. *Oil & Gas Journal*. 1999; 97 (44):34. ISSN: 0030-1388.

In 1965, Shell discovered fields 90 km south of Warrin's shallow waters off Nigeria, but the complex geological settings prohibited early development. The company cited new drilling technology as the key to making the field economically viable.

Stagg, R. M. **The development of an international program for monitoring the biological effects of contaminants in the OSPAR convention area.**

Marine Environmental Research. July-December 1998; 46 (1/5):307-313. ISSN: 0141-1136.

Under the OSPAR convention, programs were developed to control pollution in the northeastern Atlantic, the North Sea, the Celtic Seas, and the coastal zones of Western Europe. This paper discusses new programs to monitor the impacts of PAHs, tributyltin, heavy metals and marine environment quality.

Takin, Manouchehr. **U.S. sanctions against oil giants at odds with its Caspian policy.** *Oil & Gas Journal*. October 13, 1997; 95 (41):27-33. ISSN: 0030-1388.

U.S. sanctions on Iran's, Iraq's, and Libya's oil industries also effect U.S. oil companies and international oil markets.

Trapmann, William; Shambaugh, Phil. **EIA completes corrections to drilling estimates series.** *Oil & Gas Journal*. November 23, 1998; 96 (47):85-90. ISSN: 0030-1388.

Drilling estimates before and after the data correction are compared. The Energy Information Administration resolved the two data problems responsible for offsetting the data set and generated revised time series estimates for well completions and footage drilled.

True, W. R. **Oil, gas tanker industry responding to demand, contract changes.** *Oil & Gas Journal*. March 2, 1998; 96 (9):99-102. ISSN: 0030-1388.

Some shipping routes are being altered due to changes in contractual relationships. Details about fleet age and tanker makers are given.

U. S. Government sues Caribbean Petroleum. *Marine Pollution bulletin.* 1999; 38 (4):237. ISSN: 0093-3651.
Caribbean Petroleum Refining intends to restart its operations at its Catao refinery in Puerto Rico, which will significantly increase the volume of wastewater it discharges. The US Government has filed suit against CPR, alleging that this discharge is in severe violation of pollutant limits indicated in the Clean Water Act permit.

U. S. imposes sanctions against Sudan oil project. *Oil & Gas Journal.* February 28, 2000; 98 (9):32. ISSN: 0030-1388.
The United States has issued sanctions against a multi-international oil venture operating in Sudan, in the Greater Nile Oil Project. The sanctions apply only to the activities of the joint venture and do not prevent other business dealings with the involved companies.

U. S. oil firms improve environmental record. *Oil & Gas Journal.* 1998; 96 (24):32. ISSN: 0030-1388.
The API used 1996 data from survey responses and governmental statistics to determine that oil firms spent less in 1996 on environmental measures and capital expenditures.

Valdez sentence begins. *Marine Pollution Bulletin.* 1999; 38 (8):627. ISSN: 0025-326X.
Captain Joseph Hazelwood, skipper of the ill-fated oil tanker the *Exxon Valdez*, started to serve his sentence nine years after his conviction for illegally spilling oil into the sea of Alaska. The court has sentenced Mr. Hazelwood to 1,000 hours of community service. In March 1989, over 1,000 miles of Alaska's coastline was affected by the oil spill, which initiated the largest oil spill response cleanup ever.

Verleger, Jr., Philip K. **Third oil shock: real or imaginary?** *Oil & Gas Journal.* 2000; 98 (24):76-80. ISSN: 0030-1388.
In 1973 and 1979 the world experienced two oil shocks, with the first one following the Arab-Israeli war and the second one following the Shah of Iran's fall from power. Oil analysts beginning in the fall of 2000 are predicting a third oil crisis. "Oil shock" or "significant decline" is defined as a reduction in the growth of real Gross Domestic Product (GDP) below projected rates by 2-3 percentage points. The episodes in 1973 and 1979 both qualify as oil crises by this definition, showing the decline of the GDP of 4.7% in the US, 2.5% in Europe, and 7% in Japan in 1973. Increases in oil prices in 1979 caused world GDP to drop by 3% from the trend.

Wasserstrom, Robert; Reider Susan. **Oil firms in environmentally sensitive areas learning to balance stakeholder interests.** *Oil & Gas Journal.* August 18, 1997; 95 (33):23-27. ISSN: 0030-1388.
Conoco, Inc.'s pulling out of Ecuador's eastern rain forest is used as an example in this paper. Strategies are proposed for helping large oil companies learn to keep a lower profile in environmentally sensitive areas.

Weber, J. M.; Crew, R. E. **Deterrence theory and marine oil spills: Do coast guard civil penalties deter pollution?** *Journal of Environmental Management.* 2000; 58 (3):161-168. ISSN: 0301-4797.
Research suggests that deterrence theory is applicable to oil spill prevention and if applied by U. S. government agencies, would result in a reduction of spills.

Williams, Bob. **Oil producers face key questions: how long will prices stay low?** *Oil & Gas Journal.* December 28, 1998; 96 (52):18-23. ISSN: 0030-1388.
Stock histories and changes in oil outlooks are reviewed.



The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.